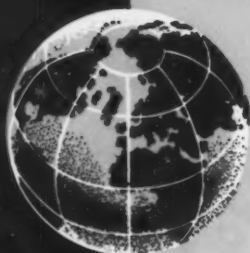


MINING WORLD



JANUARY 1959

VOL. 21 NO. 1

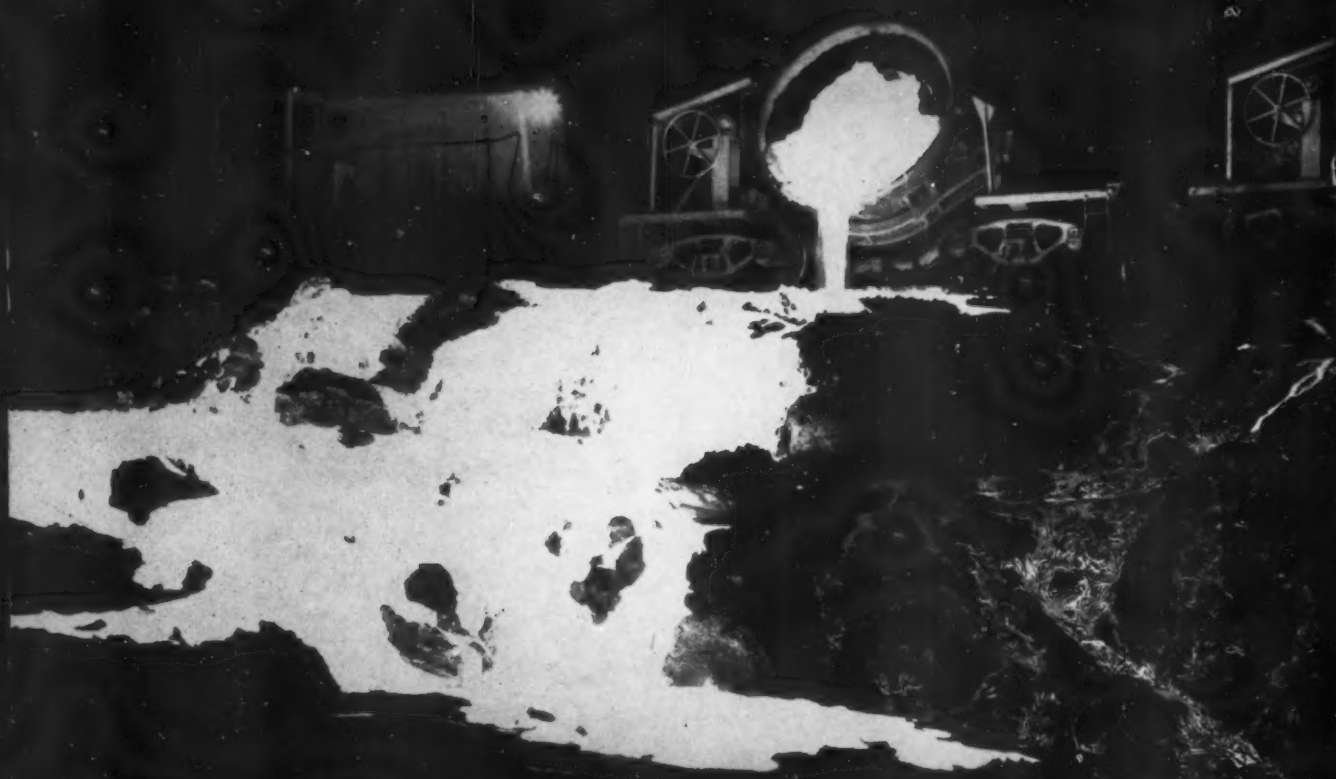
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How Western Gold Mines U_3O_8

In Grand Canyon Page 32

Mining in 1958 and Preview

"At The Mines In '59" Page 36

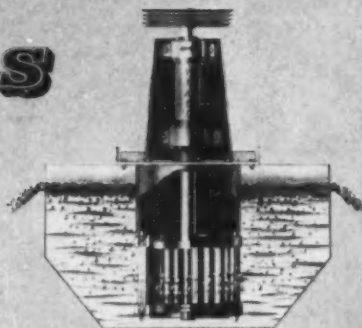


SPECIAL FEATURE . . .

Kennecott's New Smelter and LPF Plant

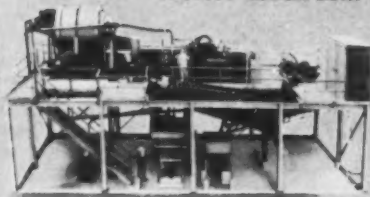
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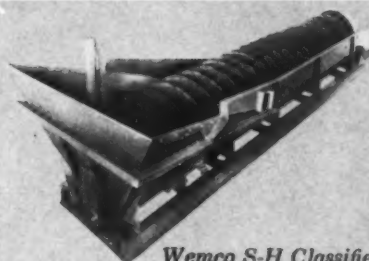
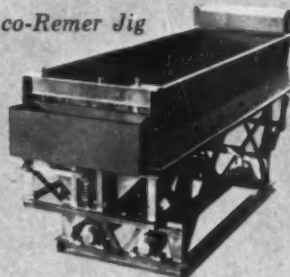


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Exclusive 4-In-1 "concrete-bucking" pry-over-shoe break-out action—breaks up, digs up, and loads out old pavement—gives big advantages over "single-action" rigs! The new TD-15 4-In-1 exerts the tremendous break-out force of 42,650 lbs! You also get "dozer," "carry-type scraper," and multi-purpose clam-shell actions in all International Drott 4-In-1's!



***NEW* International® Drott TD-15 Four-in-One**

capacity ... to outload 100 hp "single-action" rigs
plus versatility unlimited ... of exclusive clam-action

Sized, powered, geared, and controlled to decisively outproduce any "single-action" loader in the 100-hp field—the new 2¼ cu yd TD-15 4-In-1 gives you exclusive International Drott clamshell action!

Here's new big-job-sized versatility unlimited! Simply move the selector lever with fingertip ease—to get any one of four big-capacity machine actions needed. On big job after big job, the TD-15 4-In-1 can replace costly big-capacity limited-action machines one after another!

And whether this 4-In-1 replaces four or forty machine actions for you, you get it for one moderate price!

Smooth, years-proved, 115 hp 6-cylinder International diesel engine in the new TD-15 4-In-1 gives you full advantage of increased hydraulic system capacity—of new 6-speed, full-reverse transmission mobility—of new cycle-speeding forward-reverse Shuttle-Bar control!

Correct balance and long-track stability eliminate

the need for counter-weighting the TD-15 4-In-1. Track length on the ground is a full 98¾ inches!

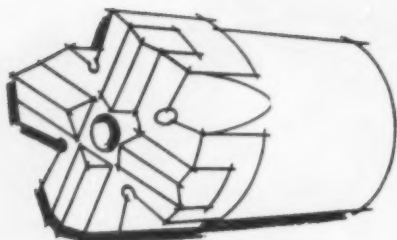
Compare capacity and versatility in your own pit, quarry or strip-mine!

There's only one way to size-up TD-15 4-In-1 performance—to measure its job range and capacity—to compare its money-making capabilities to a yard-full of one-purpose rigs. That's to get on the deep-cushioned seat and prove to yourself what it can do. See your International Drott Distributor for a demonstration!

International Harvester Company, Chicago 1, Illinois
Drott Manufacturing Corp., Milwaukee 15, Wisconsin



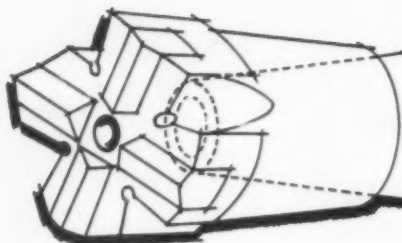
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New air-leg bit cuts your drilling costs 5 ways!

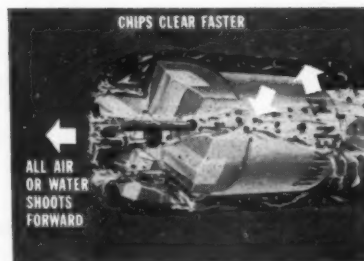
IT'S *removable* to save time and money — yet the new Timken® tapered socket bit for air leg drills has *one-piece strength*. The union is tapered! Now, for the first time, you can get the strength of one-piece bits plus these five cost-cutting advantages of removability that intraset steels can't give you:

1. No need to throw away good drill steel when the carbides wear out. With intrasetts you have to waste perfectly good steels.
2. A pocketful of bits is enough for a day's work. You haul an armful of steel with intrasetts.
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4. You carry only the bit to the shop for resharpening. With intrasetts you lug the whole steel.
5. You get longer gauge wear because there are *four* carbide cutting

edges. Most intrasetts have only two.

Notice at right how the new frontal design of the Timken tapered bit clears chips faster for extra savings. And new, special-analysis carbide inserts give superior wear-resistance, added shock-resistance. They can be reconditioned many times.

Get *all* these savings. Switch to the new Timken tapered bit. For free brochure write: The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO". Makers of Tapered Roller Bearings, Fine Alloy Steels and Removable Rock Bits.



CHIPS CLEAR FASTER because 1) five front holes shoot water or air directly against the rock face and 2) deeper, wider wing clearance lets chips wash back faster.

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MINING WORLD

Mining World

Including the Export Edition WORLD MINING

Published monthly except in April when publication is semi-monthly

VOLUME 21

JANUARY 1959

No. 1

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Underground Mining

Western Gold and Uranium Sinks New Shaft at Orphan Mine . . . 32

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Metal Mining in 1958 Plus Preview "At The Mines in '59" 36

By GEORGE O. ARGALL, JR.

MINING WORLD picks the most important events in 1958 and takes a look into the future in this "Special Report".

Placer Mining

How Brazilian Diamonds are Found, Mined, and Recovered 41

By R. E. MIERITZ

Great possibilities exist to expand Brazilian diamond production. Exploration and sampling have been difficult, but a new Calweld earth drill holds much promise. Hydraulic mining followed by crude concentration is now used to recover diamonds.

Smelting

Kennecott's Ray Division Completes LPF Plant and New Smelter 44

New LPF circuit in flotation mill recovers 2.0 additional pounds of copper per ton. The smelter produces anode copper to make Ray a completely integrated mine-to-metal operation.

Convention

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ON THE COVER

Reverberatory slag tapped from Kennecott Copper Corporation's new smelter at Hayden, Arizona, provides an eerie night-time scene when it flows over the slag dump. The material is transported in 40-ton train-ladles.



MILLER FREEMAN PUBLICATIONS



NO MAJOR REPAIRS IN 25 YEARS*

Sturtevant Construction Assures Long Mill Life at Top Loads

Sturtevant crushing and grinding machinery answers the long life top-load production problem for medium to small size plants. Many Sturtevants have been operating above rated capacities for more than 25 years, and without a major repair.

"Open-Door" design gives instant accessibility where needed — makes cleanouts, inspection and maintenance fast and easy. Machines may be set up in units to operate at equal quality and capacity.



Jaw Crushers — Produce coarse (5 in. largest model) to fine (¼ in. smallest model). Eight models range from 2 x 6 in. jaw opening (lab model) to 12 x 26 in. Capacities to 30 tph. All except two smallest sizes operate on double cam principle — crush double per energy unit. Request Bulletin No. 062.



Rotary Fine Crusher — Reduce soft to medium hard 3 to 8 in. material down to ¼ to 1½ in. sizes. Capacities up to 30 tph. Smallest model has 6 x 18 in. hopper opening; largest, 10 x 30 in. Non-clogging operation. Single handwheel regulates size. Request Bulletin No. 063.



Crushing Rolls — Reduce soft to hard 2 in. and smaller materials to from 12 to 20 mesh with minimum fines. Eight sizes, with rolls from 8 x 5 in. to 36 x 20 in.; rates to 87 tph. Three types — Balanced Rolls; Plain Balanced Rolls; Laboratory Rolls — all may be adjusted in operation. Request Bulletin No. 065.



Hammer Mills — Reduce to 20 mesh. Swing-Sledge Mills crush or shred medium hard material up to 70 tph. Hinged-Hammer Pulverizers crush or shred softer material at rates up to 30 tph. Four Swing-Sledge Mills with feed openings from 6 x 5 in. to 20 x 30½ in. Four Hinged-Hammer Pulverizers with feed openings from 12 x 12 in. to 12½ x 24 in. Request Bulletin No. 084.

*Reports Manager W. Carleton Merrill concerning Sturtevant Swing-Sledge Mill at James F. Morse Co., Boston.

**STURTEVANT
MILL COMPANY**

Clayton St., Boston 22, Mass.

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DOUBLE GRAY

... **extra high** strength

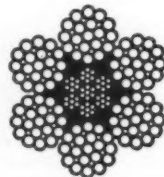
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you increased
resistance to

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PEENING
CRUSHING**

Double Gray* *extra-improved* plow steel rope will give you *extra* service life... where abrasion shortens rope life... where peening action on rope wires causes them to flatten out and split... where crushing against drums, sheaves, or adjacent wraps of rope deforms individual wires, restricting the very necessary minute free rotation of individual wires during rope use.

Double Gray was carefully *refined* over several years, and tested extensively on the largest, most powerful wire rope fatigue-testing machine in operation anywhere, *before* it was released to the field. The resultant harder, stronger steel has given Double Gray *extra* resistance... resistance that enables Double Gray to quickly repay its slightly higher initial cost in longer life and increased safety.

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MILLER FREEMAN PUBLICATIONS

JANUARY 1959

Drifts and Crosscuts

I Predict, Or . . . Fire in the Hole

Now that the New Year has staggered in, practically every respected (and disrespected) industry leader is engaging in that favorite sport of all Americans—predictions of things to come in 1959 and the next few years ahead. I'm not an industry leader, but I'm a real sporting man and that makes me half qualified (or is it half-baked), so I think I'll stir a little confusion into the prediction picture. My fearless predictions don't exactly match those propounded by Editor George O. Argall, Jr. in his review article on page 36, but he's off galavanting around the Northwest someplace, and nobody is here to stop me.

I predict that taconite will start crushing the crushers and grinding all the rods and balls which will then be recovered for shipment by magnetic separation. This will become the very latest fashion in direct reduction techniques and will furnish enough powder iron to make all editors shut-up for a while.

I predict that an enterprising lead-zinc miner will figure out a way to harness waste heat boilers to all the hot air that emanates from the halls of Congress and Capitol Hill and produce enough steam to make a large proportion of the Eastern Seaboard self sufficient with respect to power.

I predict that sometime within the next five years the British Board of Trade will somehow find a way, just once, to release copper, lead, or zinc from the United Kingdom stockpile at a time when supply is short, not when markets are sagging with a surplus. This will completely reverse a trend that has been established in the past few years and cause all mineral producers to fall down on their collective knees in awe of this mighty spectacle.

I predict that the state of Minnesota will come up with the solution to one of the most perplexing problems of all time—how to slowly throttle an iron ore industry with murderous taxes. Believe me, they have travelled a long way toward that objective already and should win this race hands down.

I predict a radical new shaft sinking method will be developed soon. Apparently some engineers are giving a great deal of thought to a revolutionary method which I wish I had been able to dream up. One development engineer was recently quoted as saying, "You always think about drilling shafts but you forget that all you have to do is turn a shaft horizontal and you have a drift or crosscut. That's where the big opportunity lies!"

I understand that a crash program is underway at a major research center to study economic ways for tilting all proposed vertical shafts to a horizontal position. A solution should be forthcoming in 1959, and it will rock the mining fraternity, though I once knew a surveyor in Butte, who was probably way ahead of his time, because he would pretty nearly always bend a vertical shaft towards the horizontal with his survey lines.

SHD



When it's unhandy to position

Hard-Face it where it Sits!

*Low Cost **STOODY 1030**—the rod that simplifies
hard-facing jobs—in field or shop!*

POSITION WELDING—Here's a new Stody Hard-Facing Rod for use on big equipment—parts that can't be positioned readily for welding! Stody 1030 is easy to weld either vertical or downhand. The arc is smooth and stable with little smoke and low spatter. Runs AC and DC. Welds to carbon steel, manganese steel and weldable cast iron.

LESS WORK—With Stody 1030 there's no slag to chip, deposits are bright and clean—ready for multiple passes and high buildups, if required.

HIGH WEAR RESISTANCE—Users who know hard-facing metals know that high alloy content is the key to more wear resistance. *With 11.3% chrome,*

Stody 1030 surpasses everything in its price class! This means longer wear per hard-facing dollar!

For high deposition rates, more actual pounds laid down per hour...for a long lasting alloy at a low price try Stody 1030! It's available from any Stody Dealer. Check the Yellow Pages of your phone book or write direct to the company. Literature available.

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MINING WORLD NEWSLETTER

Chicago... Bancroft... Washington

January 1959

A strong feeling of confidence in 1959 business recovery is growing.

A rising trend is foreseen by Prudential Insurance Company economists who anticipate consumer spending will send the total U.S. economy to a record high of \$475,000,000,000 gross national product.

The second highest steel ingot production on record may be achieved in 1959, predicts Joseph L. Block, president of Inland Steel Company. Gains in the automotive industry, steel's biggest direct consumer, are one basis for his optimism.

Higher mining production rates are expected in '59, according to Louis B. Neumiller, board chairman of Caterpillar Tractor Company, who believes this will stimulate mining machinery sales.

Consumption increases of more than 20 percent for copper, lead, and zinc in the next five years were forecast late last year by Simon Strauss, vice president of American Smelting and Refining Company.

Other encouraging signs . . .

"Four Nine" zinc sales were especially good at year end, compared with early 1958. The first quarter of 1959 will tell the effectiveness of the quotas.

Copper stocks are down now because of less 1958 output from all major world production centers. Bancroft Mines has already decided to reopen its Rhodesian copper mine early this year. So the production cycle starts its upswing.

Florida ilmenite mines of Du Pont are back on a seven-day schedule in response to increasing demand.

Steel, at its highest rate in some time, means a big bite into ore stockpiles. Mesabi Range is already preparing for a return to normal operations in 1959 with firms like Jones & Laughlin increasing beneficiation facilities. A heavy media processing plant is to be built near West Plains, Missouri to reprocess ore for shipment to Granite City steel Company mills, thereby expanding that middle western iron ore production center.

Canada's offer of free uranium to the International Atomic Energy Agency is a smart step toward winning friends for commercial Canadian uranium sales.

U.S. uranium ore producers will be given allotments at the mills; the AEC hopes to establish a market for each ore quota, and a quota for each market.

Nigerian mine operators, restricted by International Tin Agreement Quotas, see increasing interest in columbite, while a new mining flurry for barite is developing because of increased local consumption by oil well drillers.

Makeup of the new Congressional Committees appears encouraging for the mining industry.

One foe of depletion and government mineral programs, Senator Williams of Delaware, moves to top minority position in the powerful Senate Finance Committee.

However, strong supporters of mining will probably head the majority and minority sections of the Senate Committee on Interior and Insular Affairs. . . . Idaho's Senators Murray and Dworshak, while Rep. Aspinall of Colorado undoubtedly will be majority leader of the House Committee.



NEW DW20

Series G

NEW No. 456

Series B

- NEW HP** —345 (maximum output)—increased 8%
- NEW RIMPULL** —39,565 lb. (maximum)—increased 12%
- NEW SPEEDS** —increased rimpull—provides up to 20% faster travel speeds under normal haul road conditions
- NEW CAPACITY** —19.5 cu. yd. (struck)—increased 8%
27 cu. yd. (heaped)—increased 8%

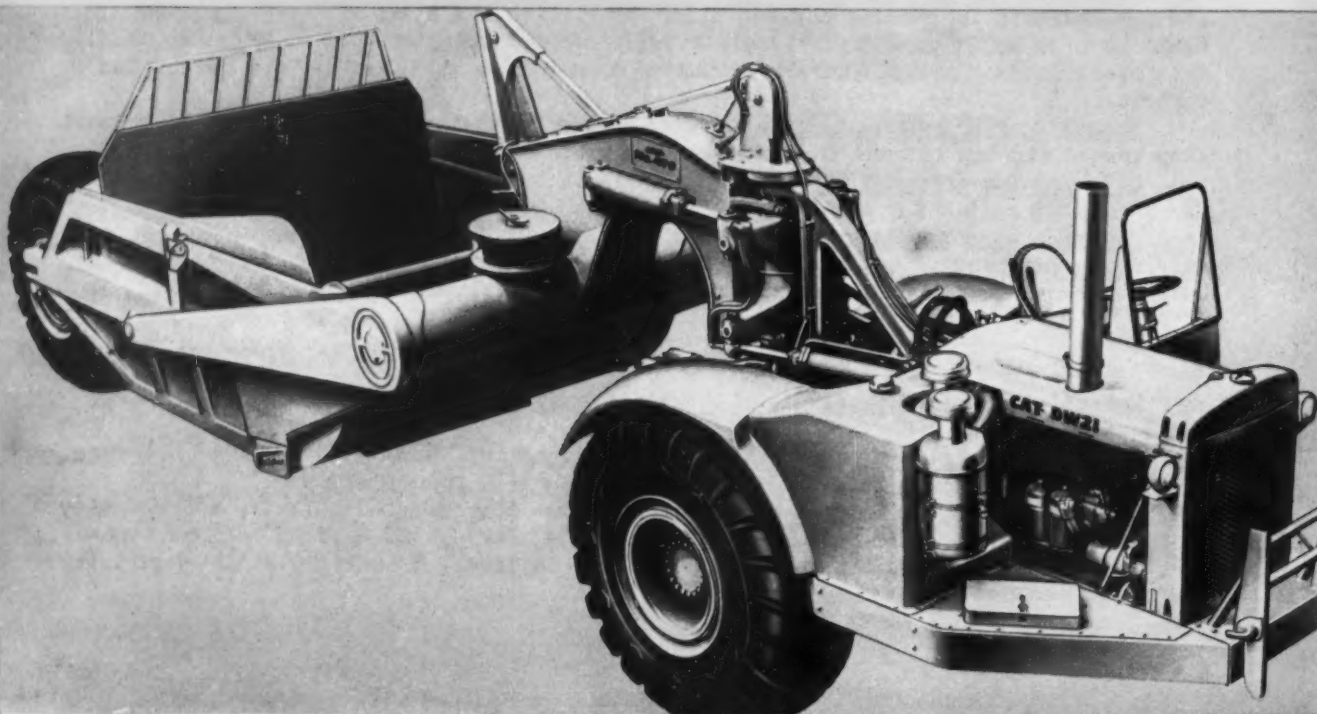
NEW DW21

Series G

NEW No. 470

Series B

- NEW HP** —345 (maximum output)—increased 8%
- NEW RIMPULL** —49,100 lb. (maximum)—increased 12%
- NEW SPEEDS** —increased rimpull—provides up to 20% faster travel speeds under normal haul road conditions
- NEW CAPACITY** —19.5 cu. yd. (struck)—increased 8%
27 cu. yd. (heaped)—increased 8%





PROJECT PAYDIRT* *pays off for you*

NEW CAT DW20 and DW21 SERIES G TRACTORS NOW 345 HP

*—plus new high-capacity LOWBOWL Scrapers
for faster cycles and higher production!*

For down-to-earth facts about these big new Caterpillar rigs, take a look at the box scores shown here. They summarize important increases in horsepower, rimpull, speeds, scraper ratings and tire capacities that pay off for you *on the job* with faster cycles, greater production and more profit!

Note that the increased HP of the DW20 and DW21 Series G, compared with the models they're replacing, gives 12% higher rimpull. This increased rimpull provides up to 20% faster travel speeds under similar haul road conditions. Equally important, this horsepower increase was achieved without any sacrifice whatsoever in the excellent torque characteristics inherent in the Cat Super-Turbo Engine. Torque rise of the engine in the Series G models is unequalled in the earthmoving industry.

In addition to the advantages featured in the box

scores, the new Series G Tractors and their matching LOWBOWL Scrapers deliver the *proved* reliability of Caterpillar-built machines. To handle increased horsepower and increased capacity, both have been improved in design and structure. The tractors, for example, have stronger final drive gears and improved transmission shifter forks. The scrapers have stronger bowls, push frames, draft frames and aprons. All these and other improvements result in better service life, less maintenance and lower cost dirt.

Here are modern, heavy-duty wheel rigs geared to the needs of today's highly competitive market—rigs that meet your requirements for moving more dirt at lower cost than ever. Get the complete facts about them from your Caterpillar Dealer. Call him today and set a date for a demonstration!

Caterpillar Tractor Co., San Francisco, Calif.; Peoria, Ill., U.S.A.

CATERPILLAR

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**BORN OF RESEARCH
PROVED IN THE FIELD**

TIRES: 29.5-29 (28-ply rating) are now standard in place of the former 29.5-29 (22-ply rating)—a tire capacity increase of 16% to match the increased scraper capacity, heavier machine weight and higher speeds made possible by more HP. Note: On the DW20 Series G, the front tires remain the same—14.00-24 (16-ply rating).



***PROJECT PAYDIRT:** Caterpillar's multi-million-dollar research and development program—to meet the challenge of the greatest construction era in history with the highest production earth-moving machines ever developed.

Right off the Wire

Before the first nuclear-powered merchant vessel is launched, a new reactor system which has been designed is expected to reduce the cost of a comparable installation by forty per cent.

After leaving a new electric shaver plugged into an outlet overnight it can be used for a week without recharging.

A radio operator's vest, with pockets for dry cells, can be worn under outer garments in arctic cold. The batteries, when kept warm by body heat, are said to last ten times longer.

Automobile batteries are now made with cells which can be removed and replaced in a few minutes.

A new electronic surveying technique, now in use in highway layout work, enables engineers to establish numerous ground control points and measure distances in a matter of minutes. Maximum possible error is only 11 inches in 40 miles.

Copper strip is being made from powdered metal. The process can also be used for other metals which can be combined in no other way.

A portable building for use in the arctic has hollow walls of nylon fabric. When the walls are inflated the building stands erect.

A research program has begun for the study of new semiconductors for use in transistors. The materials are indium phosphate, gallium arsenide, aluminum antimonide.

An insulated guard rail for the end of the boom is made to protect a crane operator in case of contact with a power line.

More and better rayon is the object of a study of cellulose growth in living trees. Two-year-old pines are injected with radioactive carbon and are later cut down for examination.

A new plastic adhesive used in aircraft construction is semi-elastic and stronger than the metals it joins.

A new titanium alloy is made into sheets that will withstand air pressures of over 100 tons per square inch.

The "world's loudest noise" can be produced by a new compressed air loud speaker that is capable of projecting the human voice for ten miles.

Further information on these news items and on Simplex cable is available from any Simplex office. Please be specific in your requests.

Twelve pneumatic tires, each supporting a load of 20,000 pounds, enable a new lift to pick up and move concrete pipe sections at five miles per hour.

The Post Office Department has awarded a contract for the development of a mechanical letter-sorting machine.

Aerodynamic shapes designed to travel at over 8,000 miles per hour can be tested in a new wind tunnel.

Layers of steel, bronze and a mixture of lead and plastic compose a new dry bearing material that requires no lubrication.

Coils of aluminum, plastic or steel, up to 82" O.D., can now be spiral wrapped by machine.

A new method of producing electricity uses a fuel cell that converts hydrogen and oxygen into direct current by means of a catalyst.

A new recording instrument measures heat absorption in any area and is used for allocating air conditioning or heating charges to tenants.

Quartz tubing is being made so small that fifty feet contain only one drop of water.

A new heat resistant paper is made of ceramic fibers.



Simplex Goes To Sea

The 36,000-foot "sea section" of the Simplex submarine communication cable, for use between Cape Neddick, Maine, and Boone Island Light, was loaded in August at Boston.

The cable came off a giant reel (dia. of head 126 inches) and was carried over a capstan to the 126-foot barge.

The cable is described as "4-conductor, No. 9 AWG stranded, ANHYDREX insulated, armored submarine communication cable."

The reel and its load of more than six miles of cable weighed 68 tons.

SIMPLEX WIRE & CABLE CO.
Cambridge, Massachusetts and
Newington, New Hampshire

Simplex

Highest quality cables for: Mining
Power & Lighting • Construction
Transportation • Communications
Signalling



Capitol Concentrates

Business Firms Ask Congress To Pass Tax Relief Law on Foreign Profits

A new flock of proposals for foreign tax relief may be expected as Congress reconvenes in January. These proposals by United States business concerns, to protect their earnings from overseas investments, grow more varied each year. This year, the State Department is adding its influence in the effort to spur foreign investments.

Hearings have been started by a House subcommittee on some of the tax-incentive plans. Among these is the plan offered by the State Department under which it would acquire the authority to make treaties that would permit United States companies a credit against their income tax bill here for taxes waived by foreign governments.

Present law permits a United States foreign tax credit only for taxes actually paid abroad; thus any taxes forgiven by a foreign government wind up being collected by Uncle Sam. Last year a tax treaty was signed with Pakistan which provided a credit against United States taxes for waived taxes, but the Senate ratified it only after the provision had been removed. The Senate action was based on the charges of unfairness to domestic business (and fears of a revenue loss), and similar opposition to easier tax treatment of foreign investments may be expected.

One proposal even goes so far as to exempt existing-type corporations from federal income taxes on all profits earned abroad. Another suggests that a special class of domestic United States corporations be organized to carry on business abroad and which could defer paying taxes on foreign-source earnings until such profits are distributed to shareholders. Under present law, all profits brought back to the United States are taxable.

Many a small mine operator in our western states would like to hear of some similar efforts to encourage the flow of capital to undeveloped properties in this country!

• Barter Suggested For Domestic Strategies

There is some sentiment developing in Washington to permit domestic strategic minerals properties to participate in the barter program to the extent that a domestic mobilization base would be maintained. Minerals would be swapped for agricultural products, placed in the supplemental stockpile, and the grain sold abroad to reimburse producers. Why not?

• Fluorspar Is On Barter List

Although the government appears to view with equanimity the impending shut-down of domestic fluorspar mines, it may be noted that both acid and metallurgical grade are on the President's new barter list.

• Hearings Indicate Strength of Conservationists

Some 249 witnesses in a period of four days appeared for and against the so-called Wilderness Bill, which would set aside over 50,000,000 acres in national parks, forests, and wildlife refuges, to allow the various areas to "go back to nature," undisturbed. While the bulk of mining associa-

tions and a good many chambers of commerce were bitterly opposed to the bill, the preponderance of witnesses were from various nature and wild life conservation organizations which were enthusiastic in endorsing the idea.

Of course, if such an area had been set aside in the Garden of Eden so that we could see now what it looked like in Biblical days, it would be a greater curiosity than Disneyland. In the proposed withdrawals, the plucking of even fig leaves (if any) would be prohibited and that might pose a problem to nature lovers. Anyway, the chances are that the conservationists are strong enough to get the bill passed.

• Three Purchase Programs Terminate This Month

The announcement by GSA that the asbestos, acid-grade fluorspar, and mercury purchase programs will terminate December 31, 1958, will come as no shock to producers. However, it deals a death blow to at least two segments of the domestic mining industry, which now will follow the tungsten producers down the drain.

The mercury industry can live though not very prosperously, at present quotations, but what the withdrawal of the government's floor price will do to quotations remains to be seen. Termination of the asbestos program probably means the destruction of that industry in Arizona, where the strategic grades affected are produced. The independent fluorspar producers already have announced the closing of their mines, leaving only a couple of "captives" in business.

As far as can be determined, neither the Interior Department nor the Office of Civilian and Defense Mobilization has any future plans to aid these industries. The stupidity of the veto of the extension of Public Law 733, which would have saved asbestos and fluorspar, now is more strongly emphasized.

• Similar Labor Program Is Expected

Current reports from Washington indicate that the Eisenhower administration plans to offer Congress a labor program quite similar to the one proposed last year but which failed to gain the approval of Congress.

The White House program for labor in 1959 is expected to call for tightening the Taft-Hartley law's ban on secondary boycotts; prohibiting "blackmail" picketing; and for granting the states more power in labor-management relations. No concession is expected regarding the repeal of Section 14 B of the Taft-Hartley Act.

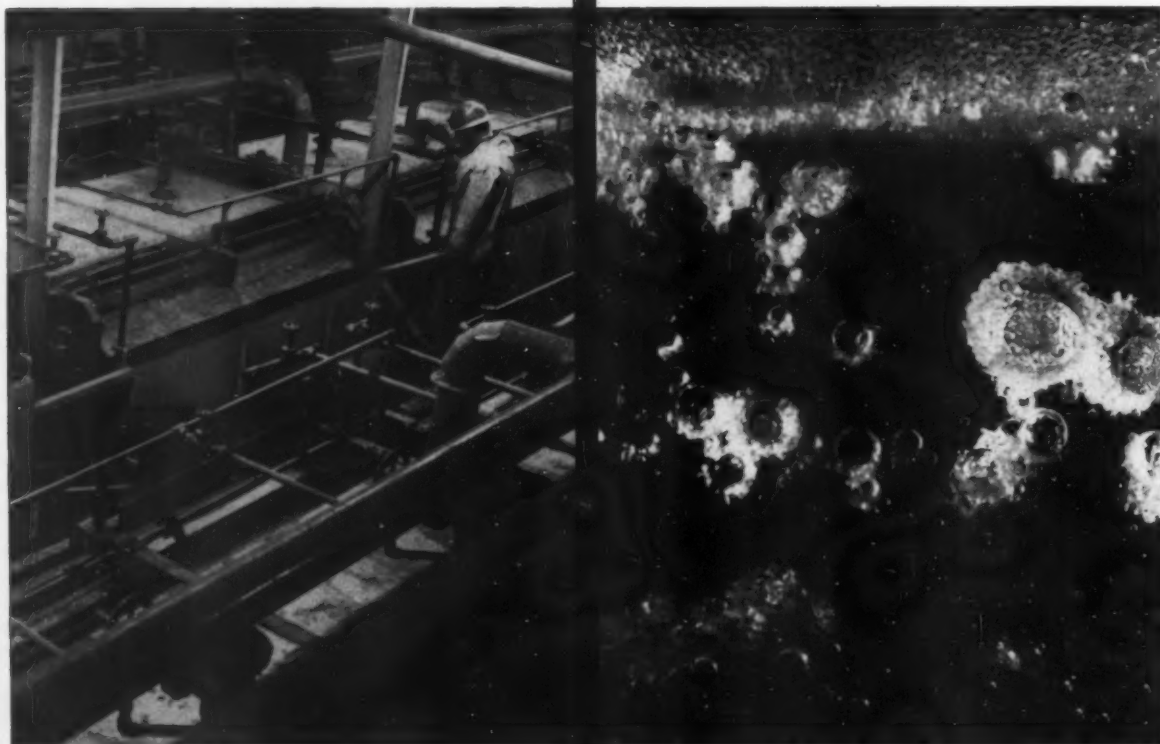
Section 14 B is the one that grants to the states the right to decide the legality of union shop contracts requiring all employees to join unions. Nineteen states have "right-to-work" laws banning the union shop, and union leaders would like to end them all with one blow—and they believe they could do so with repeal of that paragraph.

Other recommendations of the Eisenhower program which are expected to be renewed are those that call for public reports on the handling of union funds; secret ballot elections in unions; make embezzlement of union funds a federal offense; and give union members the right to sue dishonest leaders in federal courts.

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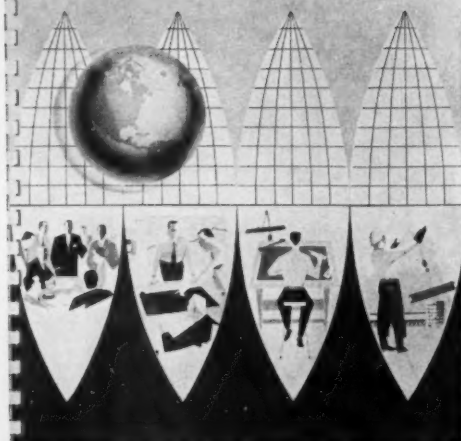
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**Here's news worth
swinging around to see...**



230 horsepower—more than 11.5 available horsepower for every payload ton.

90-degree turns—you save an average of 15 seconds per cycle when spotting under shovels or backing up to hoppers.

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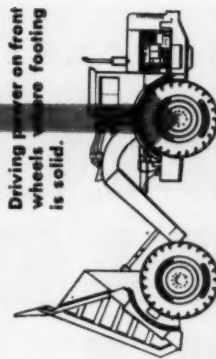
68-degree dumping angle—material rolls out of the clean, unobstructed bowl in a hurry.



**TS-260
MOTOR SCRAPER**
17 cu yd heaped
230 horsepower

**TR-260
ROCK WAGON**
20 tons
230 horsepower

Fixed wheel base—solid as a rock... and safe... The TR-260 dumps with all four wheels braked... no need to back up tractor to get loads out. And on the getaway, power is on the forward wheels where footing is solid. No bog-down on embankment lip.



Driving power on front wheels where footing is solid.

No wheel movement during dumping. All four wheels are braked.

Interchangeability for added earnings... The T-260 tractor hauls either the R-260 wagon or S-260 scraper interchangeably. Use the TR-260 for off-the-road hauling—then switch to the TS-260 for stripping or contract earth moving. Earnings are increased... you get 100 percent tractor efficiency and reduce equipment investment at the same time. *Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wisconsin.*

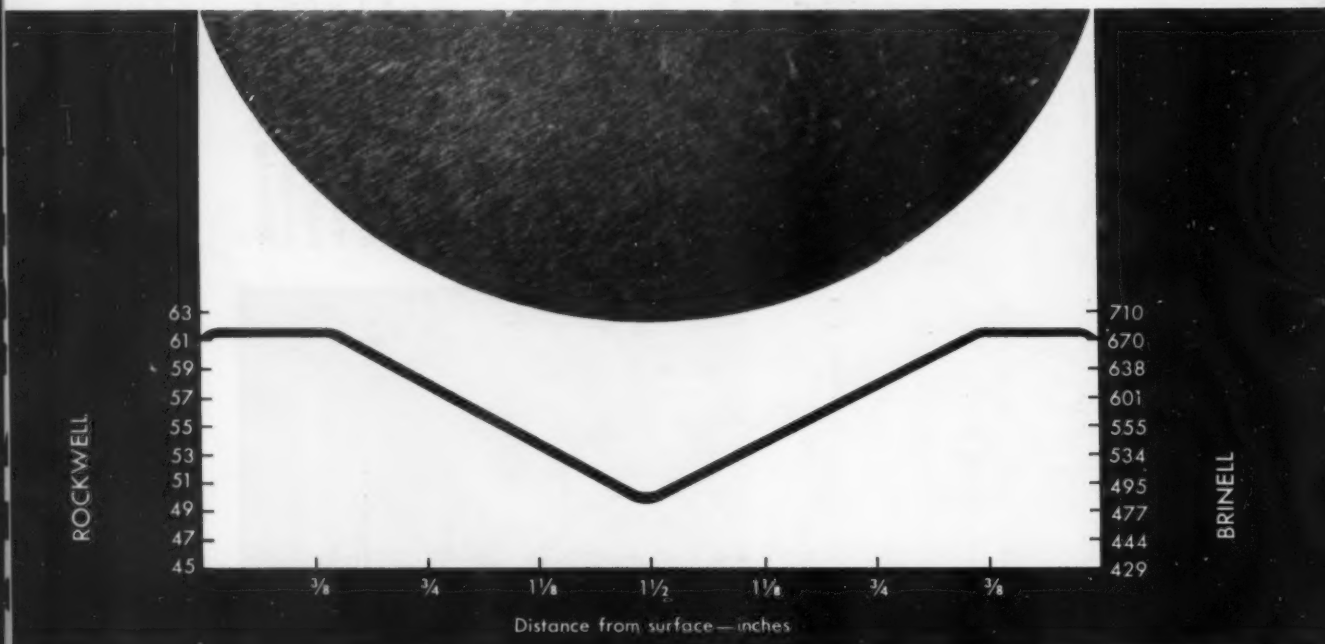


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heat-treated cast alloy steel

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cut per-ton grinding costs



Note how new casting process and full heat treatment show controlled hardness between surface and inner core.

Spectrographic analytical control of elements in steel making processes and controlled heat treatment assure the desired metallurgical grain structure which produce the type of hardness required for maximum wearing qualities.

Performance reports on Naco solid cast alloy steel grinding balls from mills now using them have been universally favorable—both in lasting qualities and impact absorption.

Structurally, they possess a grain

closely approaching tool steel—tough, hard and rugged for long lasting qualities. Laboratory tests show a remarkable uniformity in solidity, both under X-ray and specific gravity tests, with controlled hardness holding to a desired depth.

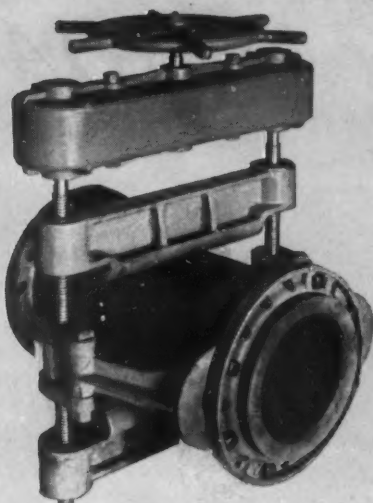
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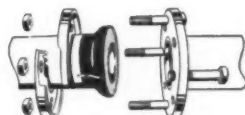
- Rubber or Neoprene sleeves for abrasive and corrosive pulps and liquids
- 1" to 14" inside diameter
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and Laboratory Equipment, too



4" x 6" Massco Laboratory Jaw Crusher

Welded steel frame; manganese steel jaw and cheek plates; bronze bushed bearings; smooth jaws give better product and easier cleaning. Adjust for plate wear and product size by convenient hand wheel adjustment.



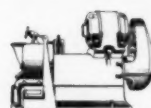
6" and 10" Massco Gy-Roll Reduction Laboratory Crusher

Reduces 1/2" feed to as fine as 10 mesh in single pass. High capacity, low power consumption.



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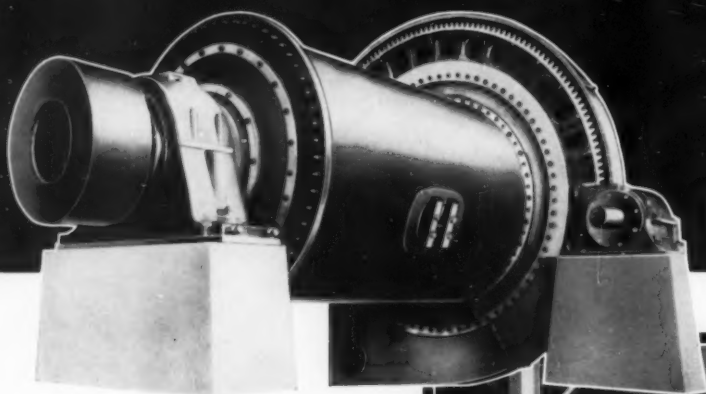
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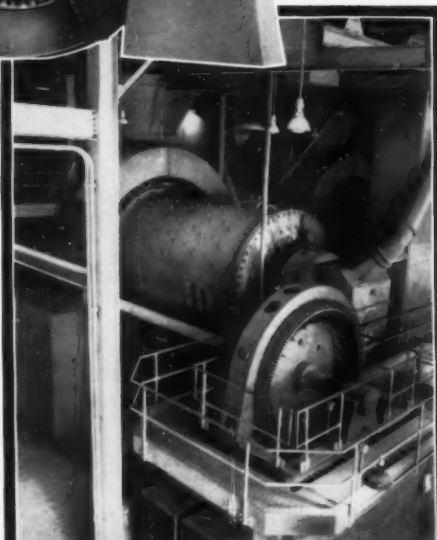


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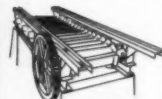
Traylor Grinding Mills are offered in a variety of types including Ball, Rod, Compartment and Tube Mills. Write for additional information.



Traylor Ball Mills are made in two types—overflow and diaphragm discharge. They are built for either wet or dry grinding.



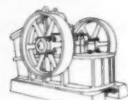
SECONDARY GYRATORY CRUSHERS



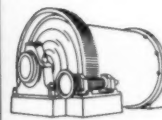
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PRIMARY GYRATORY CRUSHERS



JAW CRUSHERS



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In India's Coimbatore District, D Tournapull scraper spreads thin layer of gypsum-bearing soil. Hand laborers then remove the valuable mineral, which is used in the manufacture of cement.

India increases production of cement

**rubber-tired earthmover
helps mine
basic raw material**



Sometimes an alternate method is used to separate gypsum rock from the waste material. Here, the D Tournapull is shown dumping a load of ore-bearing soil into a screening bin. The waste earth slides down a chute to area below, and is reloaded by the same unit. This material is then spread in the mined-out areas.

With India constructing roads, bridges, dams, and buildings at a record rate, the demand for cement has grown rapidly throughout the nation. To satisfy these needs, South India, for instance, plans to double its present production of cement.

Important to this increased output is the need for more gypsum, a basic raw material used in the manufacture of cement. Although a vast quantity of this mineral is available in India, only small amounts have been mined and stockpiled for use at any one time. Today, however, modern mechanization is helping to overcome this situation.

Remove 1,529,300 m³ of earth

Typical of the way proper equipment can boost gypsum production is a mining operation in the Coimbatore District. Here contractor S. N. N. Sankaralinga Iyer, Tirunelveli Junction, Madras State, mines the mineral from 100 acres of land with a LeTourneau-Westinghouse D Tournapull scraper. The job required removing 382,300 m³ (500,000 yd³) of "black cotton" soil overburden, and 1,147,000 m³ (1,500,000 yd³) of ore-bearing soil.

Method used to extract mineral

In normal mining operation, the electric-control D Tournapull performs these earthmoving functions:

1. Removes overburden — The Tournapull scraper self-loads and removes "black cotton" soil to a depth of .9 to

1.2 m (3 to 4') where interburden of soil and gypsum is uncovered. Because this mixture has an approximate 5% moisture content, it is disc harrowed and allowed to sunbake. This layer can go down to 3.6 m (12') deep.

2. Spreads dried soil in thin layers — The "D" picks up this loosened, sunbaked soil, and spreads it in thin layers on open stretches of land. Laborers then hand-pick the gypsum lumps from the soil which vary in size up to 13 cm (5").

3. Re-loads waste — When the section is mined out, Tournapull scraper re-loads waste material and also overburden, and dumps both back into the mined-out area.

"Moves earth cheaper and faster"

Says owner Mr. Sankaralinga Iyer, "I needed a scraper that could operate economically in a limited work area. Therefore neither 4-wheel prime-mover scrapers nor big, push-loaded scrapers were of any use to me. I purchased this D Tournapull scraper after it was demonstrated at our quarry. It is fast, and self-loads both loose material and sticky clay. It moves earth cheaper and faster than any piece of equipment I have ever owned."

The new 138-hp D Tournapull with 6.8-m³ (9-yd³) scraper capacity loads and hauls *even more* material than the earlier model used on this project. Write us for more information on LeTourneau-Westinghouse machines.

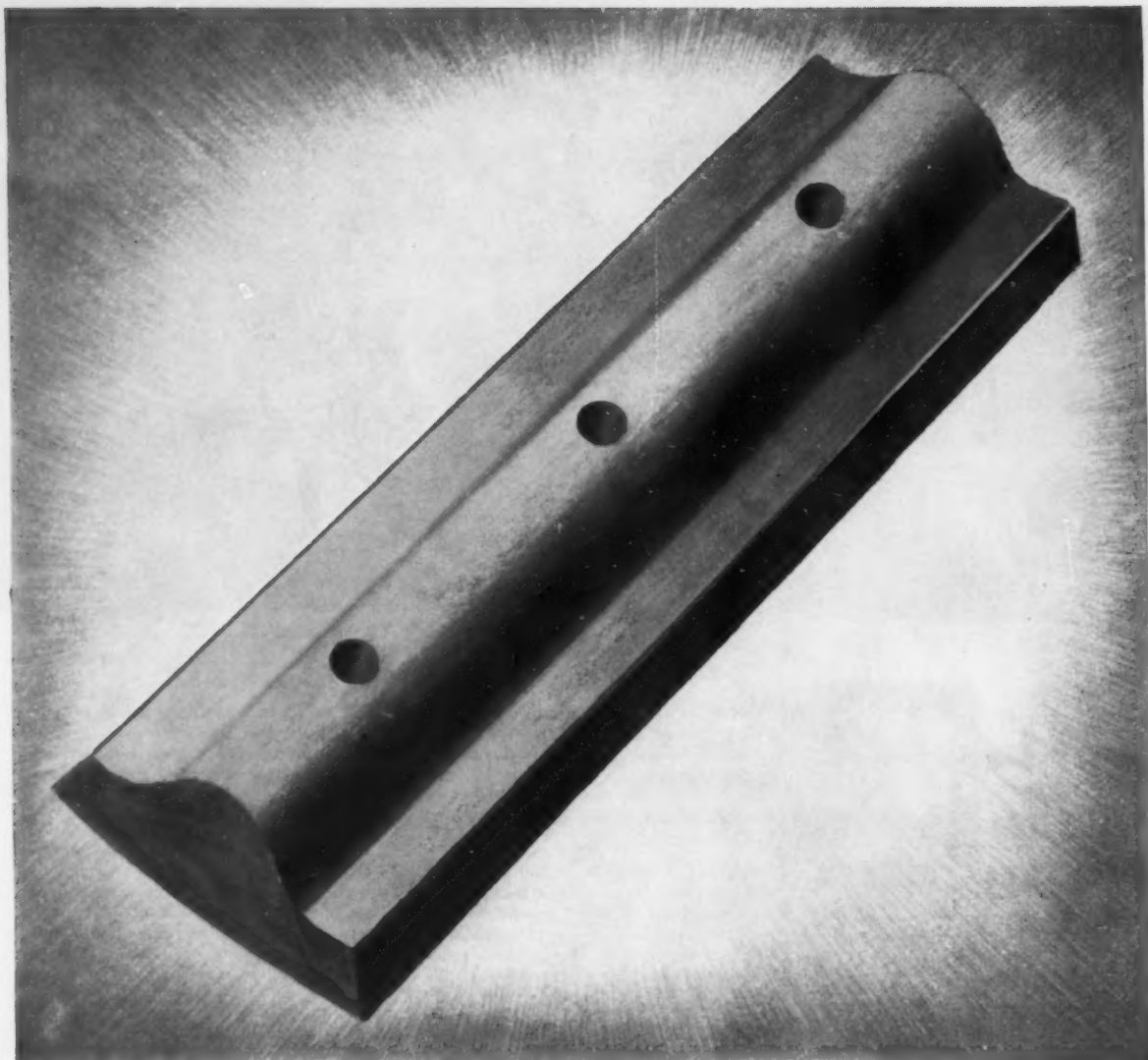
Tournapull—Trademark Reg. U.S. Pat. Off. DP-1980-MJ-1m



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20 centuries of iron mining here!

Iron mining near Eisenerz, Austria, was begun in prehistoric times, very likely by the Celts. Later these mines were operated by the Romans, long before the time of Christ.

After Roman times the area was divided into small mines. In the last quarter of the 19th Century, 33 mine owners in the Erzberg area consolidated their holdings to form the Oesterreichisch-Alpine Montangesellschaft.

Following World War II the Austrian Government undertook the management of the ancient Erzberg pits. In connection with operating this mine, the government agency also directs processing plants for the manufacture of pig iron and rolled steel products.

Modern machines at work in centuries-old Austrian pits

Since prehistoric times, men have been digging iron ore from the mammoth Erzberg deposits near Eisenerz, Steiermark, Austria. Even now, after centuries of production, the Erzberg iron mine is still the largest in Middle Europe. Mining at the present intensive rate will not exhaust these vast deposits for the next three generations, according to reliable estimates.

Move 11,000 tons monthly

Every month the government agency, Oesterreichisch-Alpine Montangesellschaft, excavates 11,000 to 13,000 tons of iron ore and waste rock, from the Erzberg open pits. Ore is being mined here on 30 levels, each about 78 feet high.

Important to this mining work are three 18-ton Model C Tournapull Rear-Dumps and a 210-hp Tournatractor, all manufactured by the LeTourneau-Westinghouse Company.

The Rear-Dumps, shovel-loaded with approximately 17½-ton loads of ore or rock, haul and return along 1.2 to 1.8-mile cycles, over rock and gravel roads. These machines have well over 15,000 working hours to their credit. One unit hauls waste rock for surfacing access roads to various pit levels. This Tournapull travels a very rough route, on grades as steep as 12 per cent.

Tournatractor levels work areas

The rubber-tired Tournatractor levels the lower areas of the pit to facilitate hauling. Due to its speed and maneuverability, this tractor handles scattered leveling jobs quickly and efficiently.

On mine and quarry operations all over the world, you will see fast LeTourneau-Westinghouse equipment at work. Write for full information.

Current Model C Tournapull Rear-Dumps, larger than the machines used on this project, carry 22-ton loads.



This 210-hp Tournatractor has done clean-up and leveling work on the lower pit levels at the Erzberg iron mine since 1950.

Tournapull, Tournatractor—Trademark Reg. U.S. Pat. Off. DRCT-1914-MJ-1m



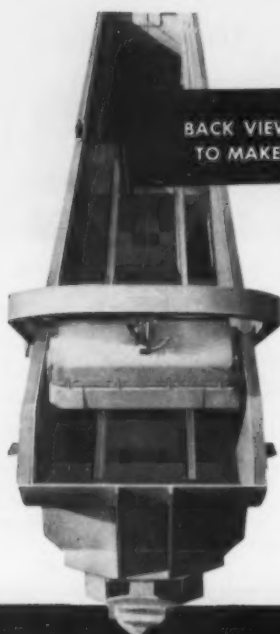
LeTourneau-WESTINGHOUSE Company EXPORT DIVISION, PEORIA, ILLINOIS, U.S.A.

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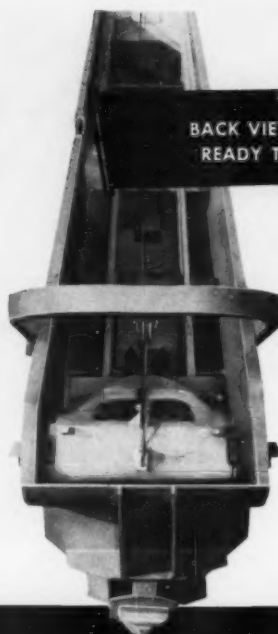
Factories in Sydney, Australia; Campinas, Brazil; and United States of America

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BACK VIEW SCRAPER READY
TO MAKE DOWN-STROKE

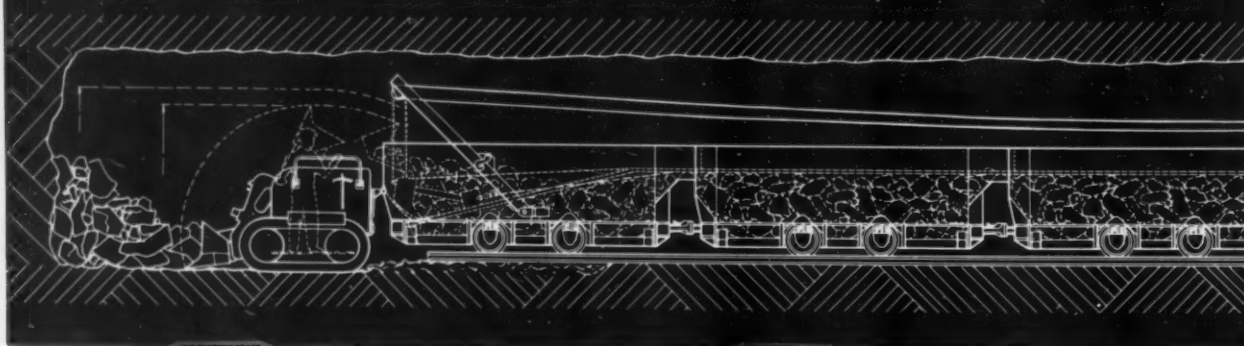
- NO CAR SWITCHING! S-D Slusher-Train's self-contained scraper loads each car progressively in-train!
- NON-STOP DUMPING of entire trip because S-D Automatic Bottom Dumping Cars in S-D Slusher-Train dump one-after-another while moving over bin or dump.



BACK VIEW SCRAPER
READY TO SLUSH-OUT

- After drift work is completed, S-D Slusher-Train can be converted to regular production work . . . and you have Sanford-Day's exclusive "Overlapping Ends," making it possible to load without spillage between-cars when loading under chutes or conveyors into one car, then another!

WHY S-D SLUSHER-TRAIN PROMISES YOU



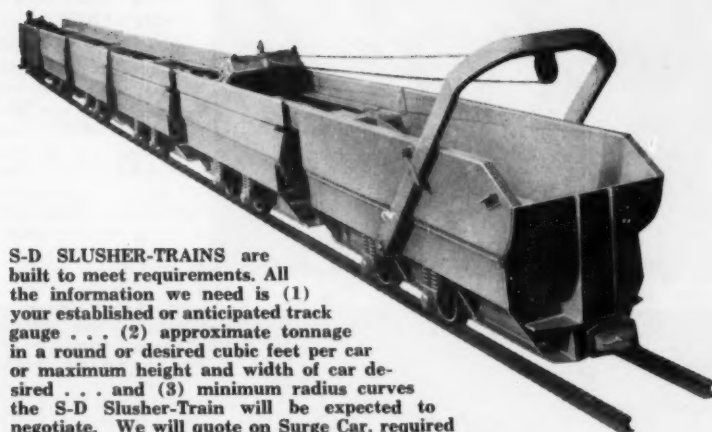
FRONT VIEW SCRAPER READY
TO MAKE DOWN-STROKE

- MINIMUM EQUIPMENT — only a loader, S-D Slusher-Train and a locomotive!
- MINIMUM MANPOWER — two men only . . . loader operator and S-D Slusher-Train operator (who is motorman when train is in transit).



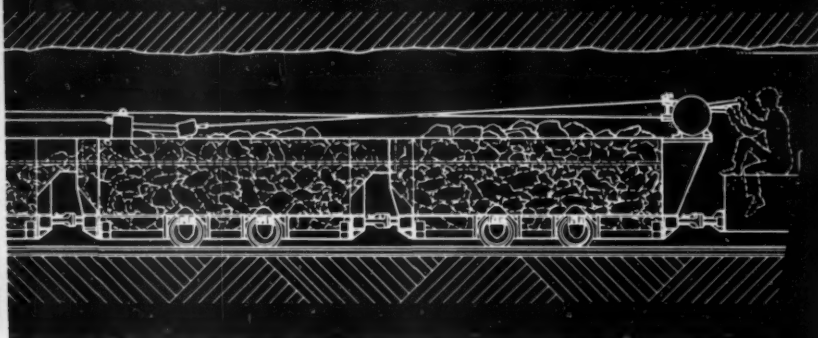
FRONT VIEW SCRAPER
READY TO SLUSH-OUT

- HIGH SPEED — There is no method that can match the S-D Slusher-Train in speed (you can easily figure on mucking out 1 to 1½ tons a minute). The "high-ball-it" speed and safety will save you days . . . perhaps weeks in completing drift or tunnel work! This means minimum cost!

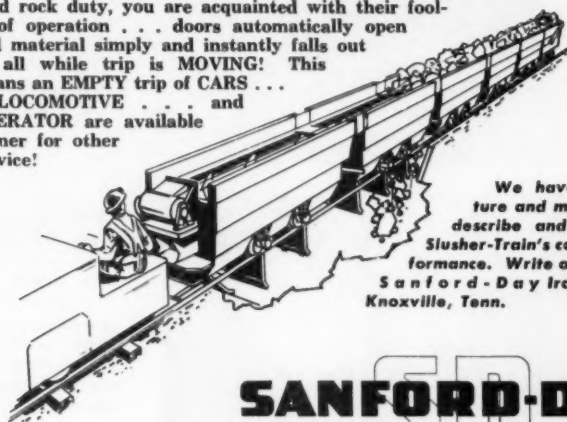


S-D SLUSHER-TRAINS are built to meet requirements. All the information we need is (1) your established or anticipated track gauge . . . (2) approximate tonnage in a round or desired cubic feet per car or maximum height and width of car desired . . . and (3) minimum radius curves the S-D Slusher-Train will be expected to negotiate. We will quote on Surge Car, required number of middle cars, and the Hoist Car, complete with slusher hoist, scraper and recommended rope.

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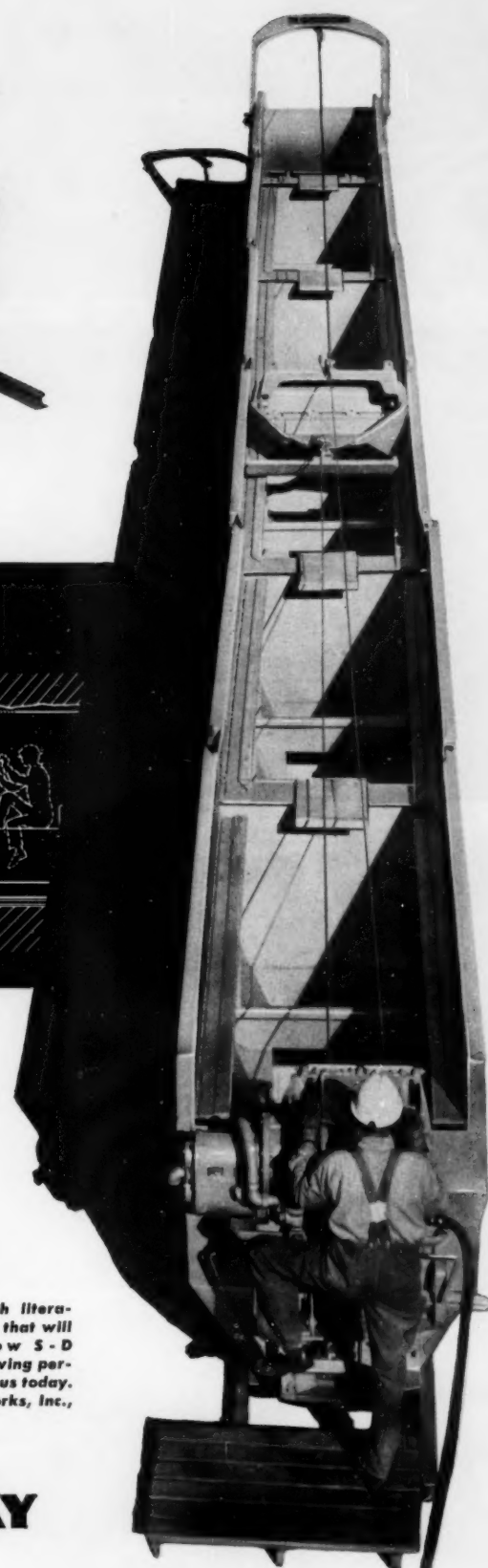
The bulk of your cost savings will undoubtedly be earned in the MINIMUM TIME S-D Slusher-Train requires to load-out a round, which is due to more efficient use of equipment and manpower. Add to this MINIMUM DUMPING TIME! If you have seen S-D Automatic Bottom Dumping Cars perform in the toughest hard rock duty, you are acquainted with their fool-proof operation . . . doors automatically open and material simply and instantly falls out — all while trip is MOVING! This means an EMPTY trip of CARS . . . a LOCOMOTIVE . . . and OPERATOR are available sooner for other service!



We have both literature and movies that will describe and show S-D Slusher-Train's cost-saving performance. Write or call us today. Sanford-Day Iron Works, Inc., Knoxville, Tenn.

SANFORD-DAY

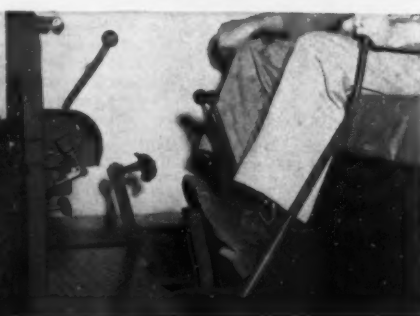
KNOXVILLE, TENNESSEE





FEATHER-TOUCH CONTACT

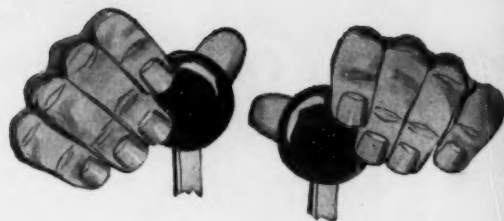
As the TD-24 pusher approaches the Payscraper, operator slows tractor speed with one hand by power-shifting planetary system; and by depressing the foot decelerator. He gets feather-touch contact without declutching, brake-riding, or throttle change!



HIGHER REVERSE

Operator uses decelerator pedal to slow engine at end of pusher run, permitting faster reverse shifting. Fast reverse speeds, coupled with power-shifted planetary steering system, allows TD-24 operators to reposition pusher extra fast and reduce scraper pick-up time.

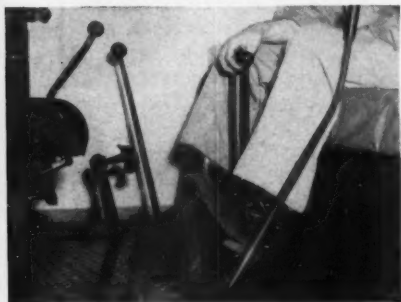
**Your operators have
fingertip control of greater
push-loading profits because ...**



PLANET-POWERED "24's" beat other rigs on all four steps of the push cycle!

"CONSTANT CONTACT" LOADING

Releasing foot decelerator instantly applies full power, for efficient loading. Power-shifting either track into high range maintains solid pusher contact on curves—applies TD-24's full power, through both tracks!



GEAR HIGHER KICK-OUTS

Once scraper is fully loaded, the TD-24 follows through as operator power-shifts on-the-go with one hand to higher gear range, boosting speed of both units 27%. This allows most scrapers to come out of the cut a gear higher.



Your push-loading profits are in your operator's hands. And your operators know they can load out more scrapers every shift when their hands control the boss of the borrow pit—the International TD-24 crawler. The four-step pusher cycle (shown) pinpoints reasons why your operators and TD-24 pushers can increase production with easier control—from contact through kick-out.

Only the TD-24 gives you this big difference in pushers: more productive effort at the fingertip command of your operators! Exclusive Planet Power steering lets your operator: 1) keep pusher speed matched to that of the scraper; 2) power shift either or both tracks up or down a full speed range with a mere flick of the finger; and 3) apply full power to both tracks even if scraper cut is made on a curve.

And your TD-24 operators can fully utilize the decelerator pedal to cut maintenance costs three ways. The decelerator reduces engine clutching; eliminates brake pedal riding for steering; and permits feather-touch scraper contact without slam-bang jarring of operators and machines.

Get all of these TD-24 features that cut the cost of loading out paydirt, with either a Torque Converter or gear-drive tractor best suited to your needs.

If you're a dirtmover, get the TD-24 stay-on-the-job story by checking with any of the thousands of owners. Ask about the comparative life of such important components as track rollers and rails, engine, transmission, and planetary steering system. Get a TD-24 on your job today by calling your International Construction Equipment Distributor for a demonstration. Then you'll see how the TD-24 earned the right to be called "Boss of the Borrow Pit"



***International
Construction
Equipment***

International Harvester Co., 180 North Michigan Avenue

A COMPLETE POWER PACKAGE: Crawler and Wheel Tractors ... Self-Propelled Scrapers ... Crawler and Rubber-Tired Loaders ... Off-Highway Haulers ... Diesel and Carbureted Engines ... Motor Trucks ... Farm Tractors and Equipment.

USERS OF **NEW**
ROEBLING HERRINGBONE* WIRE ROPE
HOLD THESE TRUTHS
TO BE SELF-EVIDENT...



That Herringbone is the most practical and needed wire rope development to come along in years.

Herringbone, the regular lay and Lang lay rope, is actually two-ropes-in-one rope. Thus, the qualities that make these two ropes good ropes, combine to make Herringbone excellent.

HERE'S WHY:

The steel core of Herringbone provides the ideal support for the two pairs of Lang lay and one pair of regular lay strands used in its construction. In addition, the outer wires are heavier for extra abrasion resistance, and good flexibility is maintained by the finer wires inside. This combination of features enables Herringbone to give longer service in most applications.

Herringbone has been used on a wide variety of excavating equipment and tough hoisting jobs with impressive results. Its applications are practically unlimited on installations which call for all-steel ropes and on many where fiber core ropes are now being used. Another of Herringbone's added attractions is the fact that it eliminates the necessity for stocking Lang lay rope for one job and regular lay for another.

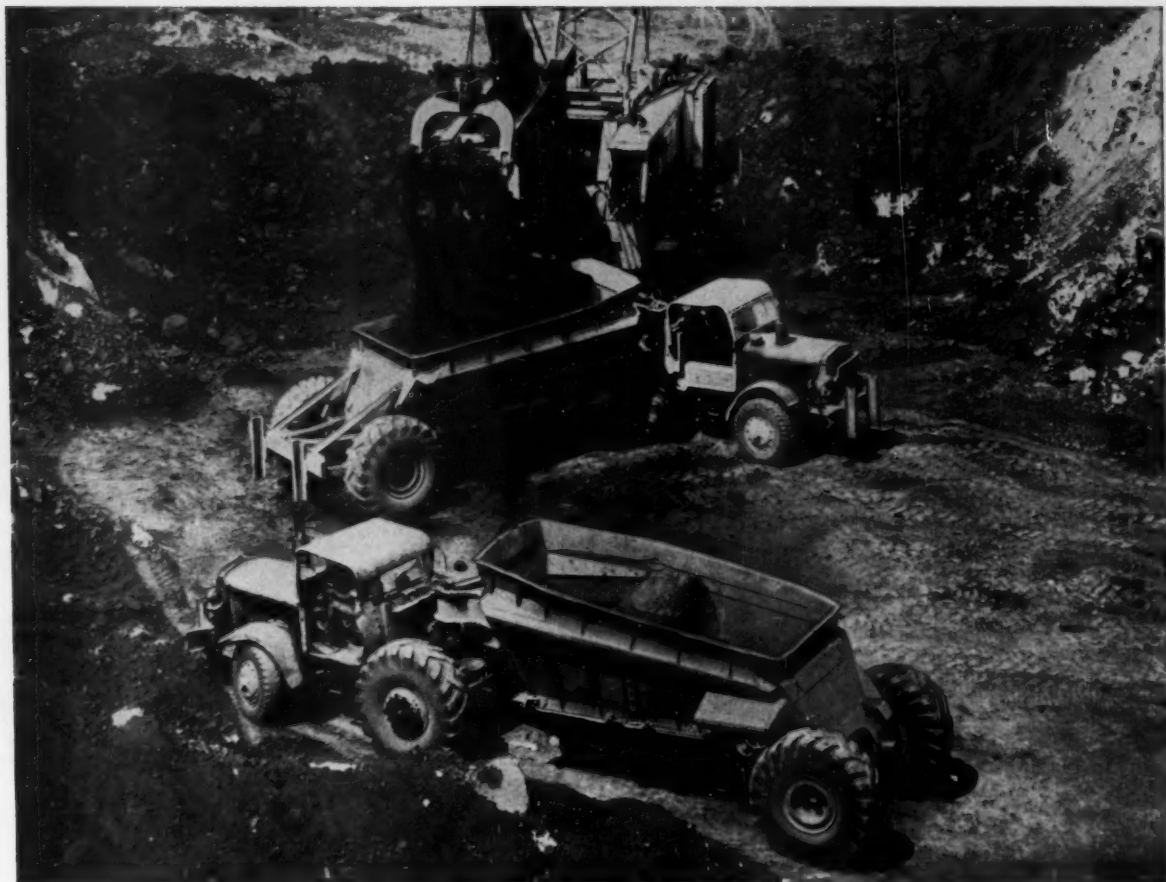
Your Roebling Distributor has Herringbone right now. He has, also, copies of a brochure describing Herringbone, the newest Roebling Star Performer. If you wish, write Wire Rope Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey, for literature and anything you'd like to know about Herringbone.

*Reg. App. For

ROEBLING

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Subsidiary of The Colorado Fuel and Iron Corporation





5 years of dependable performance at big bauxite mine in JAMAICA

The mining and export of bauxite ore for the production of aluminum is a major industry in Jamaica... one that is making an important contribution to the economic progress of this historically famous Caribbean island.

Reynolds Jamaica Mines Ltd. is one of the largest operations, shipping over a million tons of ore annually to plants of Reynolds Metals Co. in the United States. The red ore is loaded by big diesel power shovels into a fleet of 15 Euclid haulers — eight Bottom-Dumps of 15 cu. yd. capacity, and 7 Rear-Dumps that carry 22-ton payloads.

Hauls from the pits to the stockpile area are up to 7000' in length — over marl-base roads cut through the tropical country — with adverse grades up to 6%. The "Eucs" make the one-way

haul in an average of six minutes and work around the clock on a 3 shift 5 day week operation to feed the kilns and 6 mile overhead tramways to the ship docks in Ocho Rios.

The Euclid fleet has been on this continuous, rugged operation for 5 years and has maintained full production requirements. Excellent maintenance, combined with the built-in dependable performance of Euclid design, has resulted in very high machine availability for Reynolds Jamaica Mines.

For helpful facts and figures on how Euclid equipment — rear-dumps, bottom-dumps, scrapers and crawler tractors — can cut costs on your mine, quarry or construction jobs, contact the Euclid dealer in your area or write:

*Engineered to fit the job...
Euclids are your best investment*



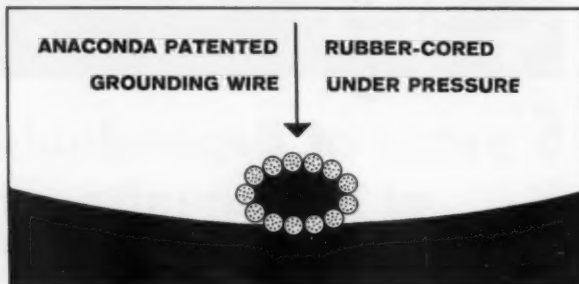
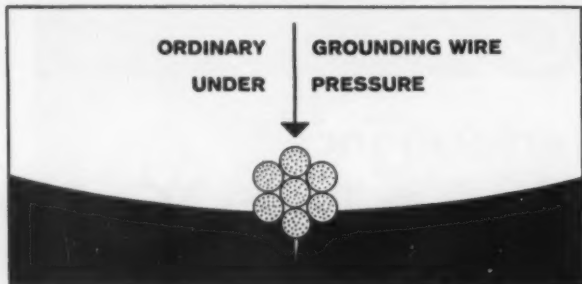
EUCLID

Division of General Motors Corporation
Cleveland 17, Ohio



IN-USE SITUATIONS LIKE THE ONE SHOWN HERE prove why Anaconda Shovel Cable with its patented rubber-cored grounding wire outlasts ordinary cable. Under pressure, Anaconda's exclusive rubber core

helps spread out the pressure—prevents internal damage. When ordinary grounding wires are subjected to the same pressure, the solid cores often cut the insulation.



Here's why Rubber-Cored Grounding Wires help Anaconda Shovel Cable last longer!

Abuse in service can seriously shorten the life of shovel cable—unless it has built-in protection, such as you find in Anaconda Shovel Cable. For grounding wire failures are one of the most common troubles. See how Anaconda engineers have solved it:

In the diagrams above you see, at left, ordinary grounding wire: a hard, compact group of stranded ropes. And at right, Anaconda patented rubber-cored grounding wire; flexible groups of stranded ropes around a soft rubber core.

When great pressure is applied to ordinary grounding wires, the small, hard grouping of wires bites into the

insulation. Result: cut and damaged insulation. *But* with Anaconda grounding wires:

- Anaconda's rubber core acts as a cushion and helps spread out the pressure—resisting damage to the insulation.
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- Anaconda's grounding wires provide broader contact with the shielding making a more positive ground.

For longer lasting shovel cable, see your Anaconda distributor or the Man from Anaconda. Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.

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ABOUT **SHOVEL CABLE**

Mining World

THE IMPORTANT MINING MAGAZINE EVERYWHERE

January 1959

INTERNATIONAL PANORAMA

MORGANTOWN, PENNSYLVANIA—The first shipment of magnetite concentrate has been made from Bethlehem Steel Company's new Grace mine. Underground mining rate is 1,500 tons per day.

WASHINGTON, D. C.—The United States government has resumed bartering of excess crops for foreign minerals. Under the new expanded program, 26 minerals are sought in place of 12 under the old program.

BLIND RIVER, ONTARIO—Pronto Uranium Mines Limited—first Blind River uranium mine in production—has now become the first company to pay a dividend from operating profits.

MOBILE, ALABAMA—The United States government has started its first stockpile of South American bauxite here. From 600,000 to 2,000,000 tons will eventually be stockpiled depending on extent of expansion plans.

RIVERTON, WYOMING—Fremont Minerals, Inc. has placed its new 500-ton-per-day parallel acid and carbonate circuits uranium mill in operation a month ahead of schedule.

SAN FRANCISCO, CALIFORNIA—Ore deposits valued at more than \$439,600,000 have been discovered with \$22,000,000 worth of Defense Minerals Exploration Administration funds in the last seven years.

LANDER, WYOMING—Atomic Energy Commission approval has been given to raise Wyoming's uranium milling capacity by 1,700 tons per day. Two new mills will be built, and three enlarged.

HELSINKI, FINLAND—A new mine and flotation mill are scheduled by Ruskealan Marmor Oy to bring into production a recently discovered copper-zinc-silver-nickel ore body.

JEFFERSON CITY, TENNESSEE—The New Jersey Zinc Company has doubled the capacity of its zinc mine and mill here to 2,000 tons per day.

SILVER BAY, MINNESOTA—Reserve Mining Company shipped 4,944,227 gross tons of taconite pellets in 1958. In 1957 5,069,960 tons were shipped.

BARKERVILLE, BRITISH COLUMBIA—Diamond drilling for gold will be undertaken on the Myrtle claims by the Newmont Mining Corporation of Canada. Initial exploration of the claims was stopped by World War II.

GRANTS, NEW MEXICO—The largest uranium mill in the United States, Kermac-Nuclear Fuels Corporation's 3,630-ton-per-day acid-leach solvent-extraction mill, is now in operation. Scheduled concentrate sales to the AEC through 1966 are estimated to total more than \$300,000,000.

ENUMCLAW, WASHINGTON—The Washington Mining Corporation is developing a new mercury district with two underground mines and has completed a 40-ton-per-day furnacing plant.

MOSCOW, RUSSIA—Two large iron ore deposits have been reported in *Pravda*. Both are in the Kursk area of central Russia. The largest, 15,000,000,000 tons must be mined by underground methods while the 500,000,000 ton deposit can be mined by open pitting.

WASHINGTON, D. C.—The federal government stopped purchases of mercury, acid-grade fluorspar, and chrysotile asbestos on December 31st.

SEOUL, REPUBLIC OF KOREA—An airborne magnetometer survey is covering 9,000 square miles in the search for iron ore deposits.

HENDERSON, TENNESSEE—The duPont Company has optioned 3,000 acres of ground here to cover heavy mineral (ilmenite) deposits found when a radioactive survey disclosed associated monazite.

FORT GOURAUD, FRENCH MAURITANIA—World Bank experts are checking the iron ore deposit of MIFERMA to determine if a \$60,000,000 loan to develop a mine and build a railroad 600 kilometers to Port Etienne is warranted.

DuPont Finds Ilmenite District in Tennessee

The DuPont Company is prospecting for heavy minerals (ilmenite, rutile, magnetite, monazite etc.) in western Tennessee. The company has over 3,000 acres under option—16 parcels near Lexington in Henderson County, and the remainder in the Camden area of Benton County.

The deposit was found when a radioactive anomaly (caused by associated monazite) was picked up. The surface outcrop was mapped and then prospect drilling began. Drilling indicates a very extensive deposit and above average grade; however, the heavy minerals are very fine grained which may create a milling problem.

The minerals are found in the Ripley formation of Cretaceous age. Almost all similar deposits in the world require a long period of erosion, followed by rapid advance of the sea, for their formation, and these were the conditions in western Tennessee at that time.

DuPont has released its option on part of the Natchez State Park. Heavy Minerals Company (Crane) is also interested in this section, and, at one time, American Smelting and Refining Company and American Zinc, Lead and Smelting Company investigated the area.

New Mercury Discoveries Will Aid Chilean Output

Mercury mining activity in Chile is on the increase. Based on two new discoveries in north central Chile the production of mercury in Chile will be about 200 flasks per month by next June.

The Compañía Minera Punataqui, S.A. near Ovalle has opened a high-grade ore body. Under way now is a program to dewater the old workings which were partially flooded during the recent unprecedented rains and to increase the capacity of the existing concentrator.

Exploration and limited production of the Union mercury mining property at La Serena is continuing with favorable results. This deposit, the second recent discovery in the last year, was purchased by the Cia. Inversiones ELK-Panamericana, S.A., a Panamanian corporation, soon after its discovery. A program is underway to complete a 50-meter shaft with two exploratory levels. At a higher level in the vein, a winze was sunk exposing large tonnages. Company officials say that they expect to reach a production of 20 flasks a month by the middle of 1959.

Next Month: Moving Bed IX at Lucky Mc's Uranium Mill

How Western

Sinking of a vertical, three-compartment, 1,600-foot deep shaft to increase production five-fold is now well along at the Orphan uranium mine owned and operated by Western Gold & Uranium, Inc., on the south rim of the Grand Canyon of Arizona near the headquarters of Grand Canyon National Park. Depth of the shaft as of October 1st was 860 feet.

The mine, producer of some of the richest uranium ore on the North American continent, has many unusual features. It is located on the only piece of privately-owned land on the rim in Grand Canyon National Park and is the only producing mine within the boundaries of a national park in the United States. Water for every purpose has to be trucked 60 miles at a cost of 1½ cents per gallon.

When the firm wishes to dispose of waste rock, it is hoisted to the surface like ore, then trucked seven miles and dumped on a site leased from the U.S. Forest Service. This is necessary because the National Park Service won't permit waste to be dumped into the Grand Canyon and there is limited room on the flat surface owned by the company. Fortunately, Western Gold & Uranium has been using the small amount of waste to back-fill stopes.

The new shaft, which will replace the low-capacity, expensive tramway presently in use, is to be completed about March 1, 1959, and with a 1,200-foot cross cut on the 1500-foot level will make access to the ore body much easier and should develop important additional ore. In fact, diamond drilling has indicated ore grade mineralization in the breccia pipe 225 feet below the planned 1500-foot level. The crosscut will be driven to the north, or towards the canyon wall, to hit the downward extension of the ore body. The ore will then be stoped.

Contractor for the shaft is Centennial Development Company, of Eureka, Utah. Fred Johnson is superintendent in charge of the project. Cost of the development will be about \$800,000, which is being paid in cash from profits made on ore mined.

The shaft has two 5-by-5-foot hoisting compartments and a 3-by-5-foot manway. The shaft has a concrete collar and uses steel shaft sets and fireproof wooden lagging. The entire installation is designed to go to any

OVER THE TRAM down into the Grand Canyon ride the Orphan miners to work.

Gold Mines Uranium in Grand Canyon

practical depth. Exploratory drilling from stations on the 1500-foot level is expected to encounter additional ore and Western Gold & Uranium anticipates sinking the shaft deeper if ore is found.

With the present tramway and the prospect-sized winze, production is small and expensive, but now that a major ore body has been proven the new shaft is justified. Mining costs are presently \$25.00 per ton, which has made the cut-off 0.30 percent U_3O_8 . With the new shaft, which will increase production from about 45 tons per day to 200 to 250 tons, mining costs will then be reduced below \$15.00 and perhaps as low as \$10.00 per ton. The cut-off point will then be reduced to 0.20 percent, which will make many thousands of tons of marginal grade material ore.

When Western Gold & Uranium took over the property it was just a prospect, and development was carried out as economically as possible. That is why the portal for the present mine workings is located 1,100 feet below the rim of the canyon. Men and materials reach the mine by a tramway suspended from six intermediate and two terminal towers, and the ore reaches the rim in the same manner. Material for the tramway was purchased from the Riblet Tramway Company, of Spokane, Washington, and erected by Western Gold & Uranium at a total cost of \$61,800.

Construction of the tramway was very difficult and was done under the supervision of Max E. Kofford, engineer and chief geologist for Golden Crown Mining Company, the firm which previously owned the property and which has since merged with Western Gold & Uranium. Mr. Kofford continues as chief geologist.

From the top, the first 1,000 feet of the tramway descends at 37°, the final 800 feet at an angle of 57°. An interesting point is that the 1,800-foot tramway takes up only a portion of the length of the claim, which is the prescribed 1,500 feet. The claim, of course, is measured on the horizontal, while much of the length of the tramway is on the steep sidewall of the canyon.

The tramway uses a jig-back arrangement with endless steel rope. It uses two 8-cubic-foot buckets, the empty one going down while the loaded bucket is pulled up. Loads run from 800 to 1,000 pounds each and complete the trip to the rim in less than four minutes. The tram is pow-

ered by a 20-horsepower electric motor located below the control tower at the upper terminal. Three of the six intermediate towers, which are all firmly embedded in concrete, are located at the break-over point where the rate of descent rapidly increases.

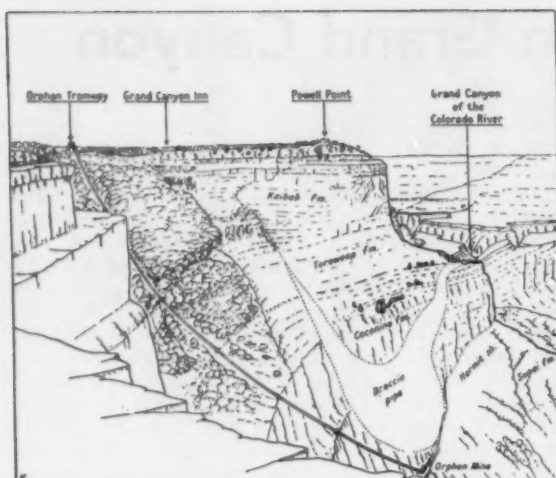
Preliminary prospecting of the property was done in 1955, when diamond drills were lugged down the precipitous slope to the discovery point. Drilling encountered considerable high-grade ore. It was decided to go ahead with construction of a tramway

and other development on the basis of the limited developed ore as there was enough value in sight to offset much of the cost in the event little or no additional ore was found.

The first ore was shipped April 25, 1956, when 20 tons of an amenability test were trucked to the Tuba City, Arizona, buying station operated for the Atomic Energy Commission by Lucius Pitkin, Inc. Although the ore was gathered on or near the surface where there had been considerable leaching, it averaged 0.52 percent

HUNG ON SOUTH WALL of canyon are tram line and mine buildings. No. 1 is adit portal, No. 2 lower tram terminal, No. 3 upper terminal 1,800 feet away, and No. 4 is mine bunkhouse.





GEOLOGICAL SECTION of the south rim shows how the Orphan breccia pipe cuts through Paleozoic sediments. The pipe has been proven by drilling to extend hundreds of feet below mine portal.



GRAND CANYON LODGE at upper right is owned by the mining company. This photograph was taken from same point as geological sketch was made. Picture doesn't show as much of Canyon wall however.

U₃O₈. With the AEC development bonus, it was worth \$83.00 per ton, or \$44.50 without.

Starting at the outcropping, Western Gold & Uranium drove a horizontal adit at right angles to the rim for 35 feet, then turned left to a point where a vertical winze was sunk. The drift averages 15 feet in width and part is used for a maintenance workshop. The drift was through solid ore, which was shipped to the Rare Metals Corporation mill at Tuba City, to which nearly all shipments to date have been made. The wall on the left side, between the drift and the canyon wall, also is solid ore and will be removed later. Sinking of the winze started in September, 1956, and so far is 175 feet deep—all in high grade ore.

While the winze was being sunk an assay trainee on the job turned in reports which the company could hardly believe, as they were over 4.0 percent U₃O₈. Settlement checks and reports from the uranium mill, however, confirmed them. Between January and March, 1957, shipments to the mill from the winze and workings on the 100 and 175-foot levels averaged nearly 2.00 percent.

The winze has one 4-by-4-foot hoisting compartment and a 30-by-48-inch manway, and is timbered throughout. A 25-horsepower Ottumwa hoist is used to lift the ¾-ton mine cars. An additional development winze is offset 30 feet from the bottom of the first and goes down another 75 feet and is part of the project developing the 250-foot level.

Mining is presently carried on in the drifts on the 100-foot level and in a stope on the 175-foot level. Vertical manways have been driven to connect the workings on the two levels and to

improve ventilation.

Six-foot Coromant steel is used with Atlas Copco drills. The water is normally piped down from the rim, but during wet weather some seepage water is caught and utilized. Compressed air is furnished by two compressors. One is an Atlas Copco rated at 620 cubic feet per minute and is located on the surface, while the other is an Ingersoll-Rand 500 cubic feet per minute compressor located in an adit driven by Daniel Hogan, the prospector who originally located the claim, and is electric driven. Apache 45 percent powder is used for blasting and is fired by fuse and cap.

In the drifts, an Eimco Model 12-B mucking machine is used to load the ore into 16-cubic-foot ore cars, which are hand-trammed to the cage, where they are hoisted to the adit level and trammed to the portal. The cars are dumped into an air-operated skip, which is lifted 50 feet to the lower tramway terminal and dumped into two divided bins, which in turn empty into the tramway buckets.

There are good backs in the drifts, with no bolting or extra support required. Production from the drifts and stopes is regulated to keep the tramway working at full capacity.

Thus far, the cut and fill method used in the stopes has permitted all waste to be disposed of underground. In fact, additional waste rock has been brought in from the outside.

Ventilation is provided by an 8-inch electric blower, driven by a 10-horsepower motor, and located on the adit level. Eight-inch vent lines are run down the winze.

The ore is mostly trucked 92 miles to the Rare Metals mill by G. L. Gibbons Trucking Company, which

has a shop located outside Grand Canyon National Park at Cameron. Since July 1958 some ore has also been shipped to Vitro Uranium Corporation, Salt Lake City, Utah. The AEC haulage allowance of 6 cents per ton mile helps offset transportation costs. Gibbons always hauls two loads a day, sometimes three. The ore has sufficient moisture so the truck beds do not have to be covered.

The Orphan Claim, which has an interesting history, was located in 1893 by Daniel Hogan, an experienced prospector who apparently noted the structure, colored stains on the rocks, and a mineralized outcropping 1,100 feet below the rim. Development of the prospect was slow because Hogan had to make his way up and down a combination of trails, ladders and ropes to reach the site, carrying all supplies on his back.

Hogan served with the Rough Riders during the Spanish-American War, with Teddy Roosevelt as his commanding officer. Hogan applied for patent on his claim in 1906 and when it was granted it was signed by his former commanding officer, then President of the United States. This, of course, was long before the formation of Grand Canyon National Park.

Hogan thought the bright green material he was digging into at his prospect was copper. He proved to be 50 years too early, for in his search for copper he had actually been digging in a rich secondary uranium mineral. During his exploratory work, in which he drove more than 100 feet of adit, Hogan also encountered some black sandstone, which he ignored. That was uraninite, a primary uranium ore that was even richer and which is now the principal product

mined by Western Gold & Uranium. In Hogan's time, of course, it was virtually worthless.

The veteran prospector finally gave up on his prospect and went searching elsewhere. He died last year, but lived long enough to learn that his old claim, in which he no longer had an interest, was rich with uranium.

With the establishment of Grand Canyon National Park, the patented property became valuable as a resort site. Grand Canyon Inn was constructed on the claim and has remained in business to this day.

Hogan sold the property to Mrs. Madeline Jacobs, of Prescott, Arizona. Surface rights passed from Mrs. Jacobs to the Barrington Brothers, then to William R. Grant and then to Golden Crown Mining Company, which bought the mineral rights from Mrs. Jacobs. Golden Crown was a subsidiary owned 60 percent by Western Gold & Uranium. On July 31, 1957, the two firms merged with the name of the latter retained.

Presence of uranium was first noted on the property by the AEC in a reconnaissance examination made in a survey of all mining prospects that might contain uranium ore. Mrs. Jacobs subsequently tried to interest companies in the property but was not successful until Golden Crown took an option in 1953 at the recommendation of Arthur R. Still, Prescott consulting geologist.

Ore production through June, 1958, totaled about 14,000 tons with an average grade of 1.0 percent U_3O_8 . A valuation of \$1,400,000 was reported for the ore by the company. The highest settlement lot of ore delivered to the mill was on the basis of an assay of 4.09 percent. Some pure pitchblende has been found and an

assay of as high as 80 percent could be created.

Present ore reserve figures and grade are not available, but chances of ore to great depth are believed to be good, according to Richard V. Wyman, vice president at St. George, Utah, for Western Gold & Uranium.

When Western Gold & Uranium, which had acquired the mineral rights and use of a small portion of the flat surface on the rim, found it needed additional surface area it was decided to buy out the surface owners. Thus the firm acquired Grand Canyon Inn, which it has profitably operated for the past two summers under the management of Andrew B. Pace.

To provide additional surface area necessitated by the shaft and the planned larger production, Western Gold & Uranium purchased a campsite from private owners just outside the park. All personnel will move their trailer houses to the new, larger location when the facilities are completed and will be transported to and from work.

Board Chairman of Western Gold & Uranium, which has been actively engaged in the mining industry for many years, is Ralph G. Brown, with headquarters at 42 Broadway, New York, New York. President is Russell L. Richards with headquarters at the company's main office at St. George, Utah. Mining director is C. E. Prior, and vice president is R. V. Wyman. Mine superintendent since August 1958 is Maurice Castagne.

A brief geological report on the Orphan ore deposit was especially prepared for MINING WORLD by Max E. Kofford, the chief geologist, who supervised the initial drilling, engineered the tramway and contributed most to the geological knowledge of

the deposit. The report follows:

"The Orphan ore body occurs as an accessory to a breccia pipe that outcrops in undisturbed Permian sediments. We believe the pipe is crypto-volcanic in origin (a diatreme); and that a solution cavern in sedimentary limestone is an accessory to the basic diatreme structure.

"The vent is circumscribed by a shear zone. The characteristics of this zone vary with the formation; and of the formations tested to date, this zone is much more pronounced in the Supai.

"Additional structural characteristics within the pipe are pre-mineral, inter-depositional, and post-mineral brecciation and faulting; irregular bedding of thinly laminated material that is characterized by marked unconformity, and by minor 'flow structure.'

"We believe that the breccia pipe—and therefore, of course, the mineralization—is Quaternary in age.

"Most of the mineralization occurs as a complex very fine grained aggregate that besides uranium includes minerals of antimony, cobalt, copper, gold, iron, lead, magnesium, manganese, molybdenum, nickel, silver, titanium and zinc, in addition to silica, clay minerals, calcite, feldspars and barite. A number of other elements are indicated by spectographic analysis.

"The mineralization occurs for the greater part in the primary form. The primary minerals were apparently deposited under a wide temperature range. Secondary minerals occur in the leached upper part of the pipe, above the adit level, and in numerous post-mineral shear zones. There is some secondary enrichment. Alteration is extensive."

THE END



ATLAS COPCO drills with AirLegs are used for drilling. This slab round in a stope will break about 50 tons of high grade uranium ore on the 175-foot level below the adit portal.



LOADING BROKEN ORE with a 12-B Eimco. The ore is now handled several times before it reaches truck bin on rim. New shaft will eliminate these extra steps.



SPECIAL REPORT

Down The Line With The Mines In '59

The dominant factor in world mining in 1958 was Russian Economic Warfare. While some called it Rubble warfare, others termed it the year of Metal Disorganization. Unfortunately for the mining world the predictions made in a similar Review and Forecast article just one year ago, "Notable quantities of zinc, chrome, tin, gold, and mercury broke the Iron Curtain. There's more to come, too," came true.

As events proved, this forecast barely hinted at the flood of a wide variety of metals turned on and off at the calculated moment to disrupt the market place.

When one considers the future of metal use and demand, and thus of mining, one should remember that Russia will play an ever increasing role. Metal exports will be carried out for both political and economic reasons, and in Russia production and selling are carried out under far different philosophies than in the commercial world of the West. Consider that Mr. Krushchev said, "We declare war. We will win over the United States. The threat to the United States is not the ICBM, but in the field of peaceful production. We are relentless in this and will prove the superiority of our system."

Once again these events serve to point out the difficulty, if not the impossibility, of forecasting the future. And, in evaluating any forecasts in this article, please remember that the majority is usually wrong; if this were not so, the majority would be rich, powerful, and successful. Most certainly, many mining companies were none of these during 1958.

But, on the other hand, 1958 was the year of many positive factors for the industry. It was the year of upturn for many metal prices; it was the

year of strong metal sales in Europe contributing to price upturns, and it was the year of the lead-zinc import quotas.

For the mining industry, it was a year of United States cutbacks, of Canadian discoveries, and the year that geophysics—from geochemistry to electromagnetic really came of age. Don't forget that this also means the elimination of unfavorable areas by geophysics, as well as the indications of favorable areas.

Here are the men, the mines, the companies that made mining history in 1958.

Man of American Mining for 1958 has been unanimously selected to be Howard I. Young, president of the American Zinc, Lead and Smelting Company. In his 50 years of service to his company, the mining industry, and the United States, he has been a leader. He has faithfully and responsibly served his government through three great wars, and was a key figure in expanding domestic metals production to the fullest possible extent during two of these wars by cooperative industry-government programs. For 25 years he was president of the American Mining Congress and as such was one of the mining industry's leading spokesmen.

Underground Mine of 1958 honors go to the Section 32 mine of Home-stake-New Mexico Partners in Ambrosia Lake, New Mexico for pioneering mining below the water table. This was the first of the district's many wet mines to come into production and methods and procedures developed at 32 have been of great value in developing other mines. Section 32 has proved the necessity for careful and as complete, as possible, drainage ahead of mining. By coordinating de-



Technical Development . .

San Francisco Chemical, first to float western phosphate rock.



Small Mining Company . .

Lucky Friday Silver-Lead is year's "Small Mining Company."



Underground Mine
Homestake-Partner's Section 32 wins the underground award.



Geochemistry of Age . . .
Discovery of copper anomaly points to Craigmont ore body.



Open Pit Mine
Lucky Mc's U_3O_8 pits in Wyoming bulk strip, selectively mine.



Price Instability
Russian economic dumping tactics depress metal markets.



Foreign Underground . . .
Mine of year: East Rand Proprietary at world's record depth.



velopment with available pumping capacity, it has been possible to consistently drive over 1,000 feet of heading per month and yet hold water inflow to 500 gallons per minute. With careful mining, the water content of ore has been reduced from 50 to 10 to 14 percent and production steadily increased. With stopes averaging 6.5 feet high in September 5,100 tons of ore were mined with a total of 512 underground man shifts. This is 12.4 tons per man shift.

The Small Mining Company of 1958 has been judged to be a Coeur d'Alene (Idaho) silver-lead-zinc mine. It's well named, too—Lucky Friday Silver-Lead Mines Company. This small mining company has been so successful that at year's end one of its larger neighbors was seeking to purchase control. Lucky Friday is the lucky example of a small underfinanced company, with hard working determined officers, which grew to a full fledged producer with a brighter future—no mean accomplishment under recent base metal prices. Remember that the Lucky Friday claims were sold for \$119.04 in delinquent taxes in 1936 and then remember that from 1940 to 1958 the company paid \$1,501,700.85 in dividends.

The Technical Achievement for 1958 was the commercial flotation of western phosphate rock by the San Francisco Chemical Company at its 1,000-ton-per-day mill at Leefe, Wyoming. This achievement was selected for the high honor because of the initial success of the operation in producing a variety of fertilizer products from what had been sub marginal ore reserves and for the more important longer term effects it will have in extending reserves. Also, it makes the greatest possible use of a natural resource, converting this resource into food for the ever-growing population. Like so many other technical achievements, this one will have a greater benefit on a corollary operation than it does in its own branch of technology. In this case, mining will benefit more than metallurgy. In the words of D. L. King, San Francisco's president, "Selective mining methods will be rendered obsolete. We can now mine seams up to 22 feet in thickness and we can fully mechanize our mines." It's not all one sided, though, as metallurgists will profit by San Francisco's technology and apply it to other minerals.

For fast stripping, followed by

selective mining under a strict ore grade control program, Lucky Mc Uranium Corporation has been picked as the operator of the **Open Pit Mine of 1958**. This program yields maximum extraction with minimum dilution of uranium ore from lenses which are erratic both in distribution and grade. Initially, 25 cubic yards of over burden have been moved to mine one ton of ore. This ratio may go as high as 45 to one for the deeper lenses. In some respects, Lucky Mc's pit has been the testing ground for new equipment—that's important for the industry, too.

Lead And Zinc Were the Metals of 1958. In point of governmental action, international interest, and mining importance, these metals had no rivals. History was made when President Eisenhower, in recognition of the importance of a strong domestic lead-zinc mining industry, instituted import quotas on these metals. The effect of quotas was immediate in the United States—higher metal prices; reopened mines, mills, and smelters; and reinterest in prospecting. Internationally, two United Nations conferences were held, without specific remedial measures, to take action in the face of surplus mine production of lead and zinc in 1959.

Fastest Growing Mining and Metallurgical Company is Fremont Minerals, Inc. which started ore through its second uranium mill in November. The firm has owned and operated the first off-Colorado Plateau mill at Edgemont, South Dakota since July 1956. The second mill, at Riverton, Wyoming, treats custom ores and is the first to parallel acid and carbonate leaching circuits with solvent extraction of uranium.

Electron beam melting of refractory metals under a high vacuum as originated and developed by Temescal Metallurgical Corporation was the **Metallurgical Development of the Year**. Impurities are boiled from the melt under electron bombardment of impure metal stock under a vacuum. It may prove important in refining of columbium, tantalum, beryllium, molybdenum, vanadium, and zirconium.

Eastern Discovery of the Year was in eastern Tennessee where Putnam Exploration Company found ore grade zinc mineralization to extend the Treadway district in Hawkins and Grainger counties. Mineralization in this new district compares with that in the nearby, older, and much better known Mascot-Jefferson City district. Also in the east, reports from southeastern Missouri hint at a lead discovery by a copper company. Geological and geophysical surveys preceded actual drilling apparently.

What was the United States Discovery of the Year? Very frankly, it's hard to know. With exploration so drastically slashed by many companies, there just wasn't as much looking or drilling. And then, of course, the lag in announcements always makes it most difficult to pinpoint discovery date. Perhaps announcement is better and more accurate than discovery. Here are some candidates. Take your choice. Announcement of earlier discovery of vanadium in Nevada at the Bironi claims under option to Union Carbide Nuclear Company. Yes, this was a prospector's discovery. Or was it one of the discoveries of blind veins by deep cross-cutting in the Coeur d'Alenes, such as Black Bear Silver Lead Company's leased Erin claim, Bunker Hill's lead-silver vein in search for Senator Stewart vein, or Sunshine Mining Company's silver-copper vein in the footwall of the Chester fault on the 3700 level.

Wait a minute. What about the "new" ore body discovered by surface drilling at Kennecott Copper Corporation's Ray Mines Division in Arizona. Time could very well prove this to be the **Geological Discovery of 1958**. It is well known that extensive diamond drilling has been underway. Definite facts are hard to confirm but it is believed the ore body did not crop out. It contains some oxide ore, grade is unannounced, but the tonnage looks very very good. It's reported as a geological discovery based on projection of proven structures in the Ray open pits and underground workings.

Alaska, the newest state, was the scene of the **United States Geophysical Discovery of the Year**. It was iron made by an oil company—Humble Oil and Refining Company—in the search for oil. Drilling a geophysical high found high-grade iron not oil.

Another interesting Tennessee discovery can best be described as the **Radioactive Discovery of the Year**. This is the large and above average grade deposits of heavy minerals in Henderson and Benton counties. Radioactive prospecting indicated a strong anomaly. The DuPont Company and others mapped the surface over which the anomaly had been found and quickly realized that radioactivity was due to monazite and that the deposit had possible commercial interest as a source of titanium minerals.

Foreign Discoveries and Geophysical Discoveries again made head lines in Canada during the year. Many were in the Bell River-Mattagami Lake area. New Hosco Mines Limited discovered a large copper ore body

by drilling a three-method geophysical anomaly—aerial electromagnetic, ground electromagnetic, and ground magnetometer. Kennecott Copper's Canadian subsidiary made an important base metal discovery in the area near the Harricana River.

Full significance of Craigmont Mines Limited's geochemical discovery of copper-iron at Highland Valley, British Columbia was announced by consulting geologists during the year. Diamond drilling of the geochemical and magnetometer anomalies has already developed 13,000,000 tons of 1.86 percent copper ore, and indicated 9,000,000 of 1.49 percent. Iron content is about 30 percent.

Foreign Underground Mine of the Year must be the East Rand Proprietary Mines, Ltd. at East Rand, Transvaal which became the deepest mine in the world as it reached and passed the 11,000 foot vertical depth in H Winze. A commemorative ceremony was held on August 8th to celebrate this achievement. At the record depth, rock temperature is 123° F. Ventilation and refrigeration cools the air temperature to below 92° to permit men to work. To mine at that depth, elaborate precautions must be continually made to prevent rock bursts.

Mining Hoax of the Year was perpetrated by Accuray, Inc. which advertised a new governmental civilian agency (SEA) Subterranean Exploration Agency to guide Project (MOLE) Molecular Orbiting Low-Level Explorer with a planned altitude range of +6,000 to -60,000 feet. The mole was to be self propelled by an atomic engine energized by the molecular disintegration of the elements it traverses. To provide its own shaft to the target ore body it was required to "eat its way through the bowels of the earth." Downward launching pads are necessary for operation. The mole was to be "homed" on its target ore body by a blind guidance system actuated by the Precession Nuclear Resonance of the metal's neutrons in accordance with pulsed wave forward scatter pattern. Well, that sounds fantastic doesn't it. But it proved of interest to leading geologists and when you look back in say 10 years it may be no more fantastic than the 1958 Canadian geophysical discoveries would have looked to the bush prospectors of the early 1940's.

Foreign Man of 1958 is the Canadian consulting geologist, Dr. C. P. Jenney who directed the most successful exploration in the Bell River-Matagamai Lake district of northwestern Quebec in 1957. His work in 1958 greatly expanded the district to include the major base metal discovery of Orchan Mines Limited. He also

Mining Outlook

... appraising the future by surveying the past

► For 1959 there will continue to be idle capacity in many lines, from aluminum rolling mills to zirconium production facilities. There will continue to be a consolidation of small companies and a swallowing of others by the larger. Don't look for any real widespread and sustained boom in mining until there is a rush to build new plant capacity and install new equipment. However, it should be pointed out that the last year has seen much modernization of ore and metal production facilities so mandatory to stay in business with declining metal prices. There is every expectation that late this year new plant needs will be more of a problem than metal selling is today. By 1961 there well could be another rush for new mine and mill capacity.

Now for some more specific possibilities:

► **Look for renewed interest** in Nevada's gold—both placer and lode. Prospecting has already disclosed some interesting discoveries. Montana's gold output should be up.

The second Missouri Lead Belt indicated in this review last year has now been declared to be higher grade than the original one. The future will tell, but it looks possible for a third Lead Belt in Missouri. Or maybe it's just an extension to the southwest into Shannon County where a major copper producer found galena by Eminent diamond drilling.

► **Copper mines are still widely sought** from Michigan to Arizona; in fact, major geological departments have been given orders to bag a big one. Arizona continues to be the happy hunting ground as reported elsewhere. But, the entire southwest and Basin and Range Province may be in for another good look. It's all based on the copper found by two deep exploration projects in Arizona by competing copper miners and marketers. While much—in fact, most—of the porphyry type ore has been found in stock-like structures in igneous intrusives, recent discoveries of much copper in igneous flow rocks could mean a new geologic concept.

What about last summer's copper discoveries in Alaska? They are in a new district and rumors point to them as "major."

► **Two major taconite projects** mentioned last year are not out, by any means. Important steps have been made in both Wyoming and Minnesota. All that's needed now is money. Once appropriations are made, letters of intent for machinery, construction, etc., can be converted into firm orders with a minimum time delay. Stripping at both projects, and both will be open pit, will not be tough—probably most difficult in Wyoming.

► **Look for Nevada iron mining** to be longer term than many believe. Drilling at only one deposit has indicated 60,000,000 tons of 30 percent Fe. Luckily, it's coarse grained for not difficult concentration. And you can watch for underground iron mining, too, because several pits are getting narrow and deep.

Tennessee, where predictions were made to look for zinc in 1954, is still a good place to look for zinc. And it has proved to be a good place, too. See Eastern Discovery of the Year elsewhere in this article. The Treadwell district, site of New Jersey Zinc Company's big, but nonproducing, Flat Cap mine, can hold three or four indicated but undeveloped major mines.

Will 1959 see the United States Steel Corporation revealing what iron ore deposits it has drilled out in the Barstow area of California?

It looks like 1959 could see Kennecott Copper's second major foreign mining investment—in Greece for asbestos. The first was in South Africa for gold and uranium. Exploration will continue on many continents, too.

► **You can look for an entire new line of machines, tools, and techniques** to drill, drive, ream, or bore underground openings in any direction. It will take bold thinking and hard cash.

First you can look for new drilling techniques in shaft excavation. You will see an increase in the multiple-reaming with roller cone bits of small holes to full size production shafts. Multi-bit multi-reaming has already made progress in sedimentary rock. Its use will expand to deeper shafts in harder rock. And it won't be too long until full shaft drilling with no pilot hole will be underway.

► **Don't forget** what one development engineer said, "You always think about drilling shafts but you forget that all you have to do is turn a shaft horizontal and you have a drift or crosscut. That's where the big opportunity lies!"

Why not a new reaming technique, too? All reaming has been by lowering or pushing the bits into the hole. Why not design and build bits that can be pulled through a pilot hole? Think that one over. Pulling through a pilot hole has many advantages. Remember that pilot holes can be diamond drilled any place in any direction.



directed a crash program to stake 445 claims in the area for the Kitchigama Syndicate. Bell River-Mattagamai Lake was the Foreign Discovery of 1957. While much of his geological work was done in 1957, it was 1958 that saw the culmination of his work in the major discoveries. He is the best informed geologist on the area and his anticlinal theory for ore deposition in a series of "crumples" has been proven in two instances by drilling and indicated in others nearby by geophysical surveys.

Records and More Records. It all depends on how you figure achievements. Tons, man shifts, advance per man hour, footage per dollar, etc., etc. Certainly one of the record shaft sinking jobs of all time—based on smallest number of men on bottom and minimum man hours per foot—was set at the Thomas Bardon shaft of Shattuck Denn Company, Big Indian District, Utah, during September and October. With three men per shift on bottom the three crews sank 392 feet in 25 days. The African mining tonnage record in one day, and perhaps a world record, was set on January 31st when 88,000 tons of ore were pulled from stopes, trammed, and hoisted from the South ore body of Rhokana Corporation, Ltd. at Kitwe, Northern Rhodesia. Another Rhokana record was production of 19,784 tons of copper from 411,000 tons of ore in March.

At the nearby mine of Nchanga Consolidated Copper Mines Limited, 16 Europeans and 138 natives drove a haulage drift 1,718 feet in 26 days. Only six machines were used in the heading for a daily advance of 66.1 feet. Surprisingly short rounds were drilled—11.4 per day—for the footage. The 20,468 tons of rock broken during the month is a good sized mine in itself.

A record number of underground holes was blasted in Canada at one time when 2,000 holes loaded with over 72,000 pounds of dynamite broke 135,000 tons of ore at Lamaque Gold Mines, Limited.

Have any of you rotary drillers beaten the record of Chino Mines Division, Kennecott Copper Corporation? They drilled 520 feet of 12-inch-diameter hole in one shift on February 28.

Last year this article pointed out that records are made to be broken. They are, too. The world's record advance per month in a railroad sized mine tunnel (18 by 24 feet) of 1,080

feet announced last year as set by Utah Construction Company crews at the 5490 haulage tunnel at Kennecott Copper Corporation's Utah mine was broken. This time by the same crews, in March, with an advance of 1,363 feet. The tunnel was also concrete lined for that distance—4,810 cubic yards.

Again MINING WORLD had the opportunity to publish the **Technical Article of the Year**. It was written by J. E. Harper, concentrator superintendent, Chibuluma Mines Limited, Kalulushi, Northern Rhodesia. He described the differential flotation of copper and cobalt. The article is being translated into several languages and will be used in mills and class rooms as a "model" article.

Anniversaries and marks of accomplishment continued to be celebrated during the year, but at a slower pace than in 1956 and 1957 which may be termed the Golden Age of mining and metallurgy.

"The Silver Capital of the World"—Wallace, Idaho—celebrated its Silver Jubilee and 75th Anniversary from June 11 to 15th. All the Coeur d'Alene district mines cooperated in a program to make the American public aware of the importance of the mining industry. Radio, TV, and newspaper coverage extended from coast to coast.

The Nevada Mines Division of Kennecott Copper Corporation celebrated 50 years of copper production on May 15th. In more ways than one, it was a technological celebration, too, to pay tribute to engineering skills that have kept the operation going despite the continuing decline in ore grade.

Phelps Dodge Corporation's Copper Queen mine at Bisbee, Arizona reached its 30th year of production.

The Bunker Hill Company's electrolytic zinc plant at Kellogg, Idaho celebrated its 30th anniversary on November 6th. This is the first commercial plant in the world to produce Special High Grade Zinc of guaranteed "four-nine" purity. The first 30 years production was 1,031,376 tons of Special High Grade Zinc, 9,954,000 pounds of cadmium, and 299,999 tons of sulphuric acid.

Mufulira Copper Mines Limited, Northern Rhodesia, completed its first 25 years of production. In that period 1,680,000 long tons of copper were produced. When the mine started, ore reserves were 116,000,000 tons. At the 25th birthday, they were 169,000,000.

On April 19 the 25th anniversary of one of the most important events in mining in this century passed almost unnoticed. For it was on that date in 1933 that the Congress of the United States went off the gold stand-

ard and revalued gold at \$35.00 per ounce. A gold boom followed—but inflation has long since ended that boom. So there were only a few gold camps left to remember the date.

Lepanto Consolidated Mining Company's 10th year of post-World War II operations was on June 26th. Now one of the world's most important underground copper-gold mines, its 10-year record shows a net profit of Pesos 50,143,633.06 from total metal sales of Pesos 180,792,444.00. Production was 3,531,981 tons, 246,499,000 pounds of copper, 413,617 ounces of gold, and 1,586,640 ounces of silver.

In the metallurgical world the year was important as the 50th anniversary of continuous sintering. The world's first continuous sintering machine was put into operation at Salda, Colorado to sinter mixed sulphide ores and concentrates at the Ohio and Colorado Smelting Company. This machine was the successful result of five years of intensive work by the inventors, Arthur S. Dwight and Richard L. Lloyd. Most of their experimental work had been done at the Cananea Consolidated Copper Company's copper smelter at Cananea, Mexico, where Dwight was general manager and Lloyd was smelter superintendent.

Good Mines Die Hard but that they do end was dramatically recorded during the year when the Burra copper mine of the Tennessee Copper Company hoisted its last ore on June 13. The mine, first worked in the Copper Basin in 1850 for oxides, was reopened for sulphide ore in 1889, and operated continuously until closed. To mine the 15,636,000 tons of 1.61 percent copper, 23.5 sulphur, 31.3 iron, and 1.15 zinc ore, 239,000 feet (45.4 miles) of underground headings were driven. During its 59 years of operation, notable advancements, and several firsts, were made at the Burra.

Wanted in 1959, as in 1957, is a simple portable anchor gun to drive permanent bolts into solid rock. The miners want another simple product, too. It is a cheap, easily used, low volume, efficient catalyst, lubricant, or additive to end abrasive wear in hydraulic fill pipe lines and long distance pulp transmission lines. It would be fine, too, if its use cut pumping horsepower in half.

Union Carbide Nuclear Company would like a fast cheap mining method for its Palangana Corporation's uranium deposit near Corpus Christi, Texas. One wonders if it will be mined in the near future with the apparent "over supply" of uranium in the face of unusual mining conditions.

THE END

Brazil: An Untapped Diamond Source?

Sampling problems exist, but one company may have found the answer to this difficulty.

By R. E. MIERITZ

Great possibilities for exploitation of diamond deposits exist in Brazil. If they were earnestly explored and developed, Brazil's output could provide a substantial supply to the world market—far more than the present 3 percent or less which it is now credited with contributing.

Diamonds are known to exist in the present river beds and hills of at least 12 states in Brazil. Four states, however, are considered the principal producers. These include Minas Gerais, Matto Grosso, Goias, and Bahia. Here in these hilly, mountainous, sparsely-vegetated, uplifted plateaus, thousands of Garimpeiros (he who searches diamonds) win diamonds by primitive methods for a meager existence in the known fields.

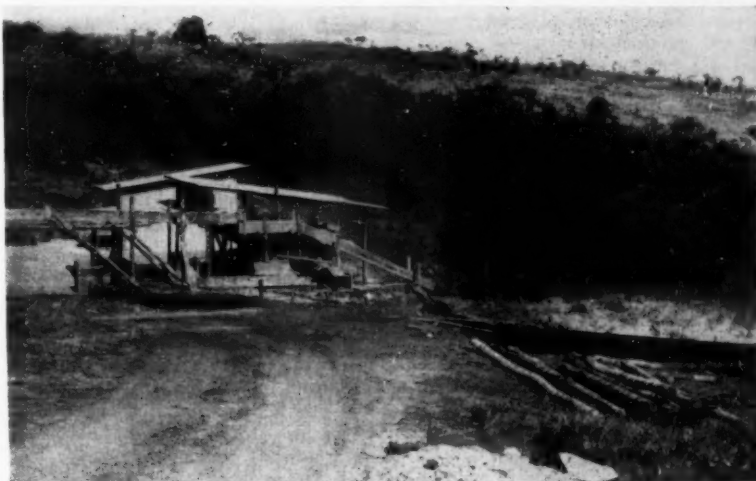
Over 90 percent of the diamonds mined in Brazil are of gem quality. This situation exists not only because gem stones command higher prices, but primarily because little attempt has been made to recover the smaller sizes and to search for diamonds which could be used for industrial purposes.

If it were not for the fact that several million carats of diamonds have been illegally exported, Brazil could possibly have been credited with some 20,000,000 carats or more over the many years that diamonds have been mined. Presently, all diamond discoveries and production should be registered with Federal authorities so that statistics can be gathered and state and Federal taxes can be collected on subsequent transactions involving the stones. Even now, however, many stones elude the Federal clutches. Overall taxes amount to about 30 percent of the gross value

Mr. Mieritz is a consulting engineer, formerly of Phoenix, Arizona, but with present headquarters at Room 950, 150 Broadway, New York, New York. He recently returned from Brazil where he completed several examinations for United Diamond Fields of Brazil.



HYDRAULIC MONITOR at Campo Sampaio mine removes about 700 cubic-meters-per-day of soft overburden near bedrock where the gem stones tend to concentrate in placers. Diamonds were first recognized in this area by a gold miner in 1721.



SIMPLE MILL consists of trommels, screens and mechanically operated diamond pans. It treats output of Campo Sampaio mine in the Diamantina area of Minas Gerais state. Before identification in 1721, local card players used the stones as counters.

of the stones with adequate allowance for depletion and depreciation.

Placers Furnish Output

To date, no satisfactory, generally accepted geological theory as to the origin of Brazilian diamonds has been written for general publication and discussion. Many renowned engineers and geologists, however, have prepared reports on various deposits in the many states since the turn of the century. The question of origin is a

subject requiring detailed information which could not possibly be covered in this article. Other than present river placers and buried ancient placers, diamonds reportedly have been recovered from kimberlite, quartz veins, and blue clays. Rocks of regional importance are the pre-Cambrian lavas, sandstone and quartzite, pre-Cambrian schist, early Paleozoic formations, igneous intrusions as diorite sills and dikes or pegmatite dikes.

Active mining is generally limited

Why deposits are difficult to sample



CONGLOMERITIC PLACER has been altered by deep lateritic weathering. Extreme softness is indicated by knife pushed, not hammered, into material. The state of Minas Gerais is credited with several of the world's largest gem stones.

to the present river channels and the buried ancient river or lake deposits which are considered the most profitable of all occurrences. These secondary deposits are classified for the purpose of this article as: (1) true placers; (2) soft conglomeritic "massa" placers; and (3) hard conglomeritic "massa" placers. The last two are ancient river channels or lake beds and are differentiated only because of their physical characteristics—namely, hardness and cementation of the material. All conglomeritic material is not necessarily "massa." This word is used only to identify the diamond-bearing formations. "Massa" not only contains diamonds, but also such heavy minerals as staurolite, rutile, tourmaline, magnetite, and zircon. The occurrence of these minerals varies in deposits and districts.

The soft "massa" deposit is usually situated at the higher elevations. Here deep lateritic weathering has altered the clays to greasy saponites and the sandstone or quartzite boulders to a soft sand of individual, sub-angular grains that still retains the boulder and gravel outline which is discernable primarily by color. This type deposit is readily disintegrated under water pressure. The hard "massa" deposit is a relatively fresh conglomerate of moderate to strong cementation and extremely difficult to disintegrate under 250 pound-per-square-inch water pressure.

Evaluation Is a Problem

Proper and complete exploration of any deposit is, to our stateside thinking, a definite pre-requisite to any successful mining operation; however,

little to no thoughts have been pursued in connection with adequate exploration and evaluation of the diamond deposits in advance of an operation. Failure to do so is perhaps a result of the generally known and accepted fact that diamonds occur always associated with the heavier minerals previously mentioned, whether in the present river channels or the ancient conglomeritic river channels or lake beds. Some exploration has been completed as small churn drill holes but this has been successful only to the extent of indicating and identifying the limits and thicknesses of the "massa." This type exploration has not been successful as a means of determining grade of the deposit. Most deposits now in production are being operated on a hit or miss schedule of insecurity, since it is not actually known whether the material contains diamonds. Recovery is the only answer in most active operations.

A factor which has perhaps discouraged "sampling" of a diamond deposit is the extremely high ratio of worthless particles to worth particles. In the case of a \$10.00 per-cubic-meter value, this ratio is approximately 54,000,000 to one, weight-wise. In normal exploratory sampling, the geologist or engineer usually thinks in terms of pounds or, at the most, tens of pounds. In sampling a diamond deposit, they will be required to think in terms of tons—usually two to four tons per sample length which should not exceed five feet but preferably three feet. Such exploration becomes a major and expensive problem since the sample requirements indicate a large area excavation

or penetration must be made to depths of 60 to 120 feet in most deposits. A comparable size opening would be a minimum 3- by 3-foot shaft.

Previous exploration and production of one deposit indicates the diamonds concentrate within the bottom three meters or ten feet of the formation immediately above bedrock. Consequently only this portion, or at the most, the bottom 15 feet of the "massa" need be sampled.

A Possible Solution

To date, sampling of a diamond deposit has not been given much serious thought; however, one operating company may well have the economic solution to the problem. Any excavation or penetration in these soft "massa" deposits requires some sort of support or guard against caving. The United Diamond Fields of Brazil has inaugurated the use of large diameter (40-inch) hole drilling with a machine not heretofore considered an exploration tool. The Calweld (bucket type) earth drill, normally used for drilling cesspools or cassion holes in construction, is being adapted as an exploration tool in this particular field. Forty-inch casing in four-foot sections with a rotating drilling shoe is used in conjunction with the drilling bucket. The hole is cased simultaneously as it is advanced. Each three-foot sample would contain approximately 2.2 short tons of material from an 8.7 square-foot hole area.

Only the bottom 15 feet of the Campo Sampaio deposit (operating property of the above company) is being sampled. The barren material above the sampled area is rejected. Samples are run through a miniature, lowboy-mounted, pilot mill where each is automatically weighed, milled, and diamonds collected. All pertinent data is recorded and valuations are placed on a specific area. It is too early at this writing to describe completely the success of the method except to say that results are definitely a great aid to the planning of future mining operations.

The rig is limited in its drilling ability since its application can only be considered for soft consolidated or unconsolidated material such as the soft "massa" deposits and present placer deposits, where it can be dredge-mounted rather than truck-mounted for portability. Drilling speeds are fantastic but, here again, it is too early to provide any specific information.

How Deposits Are Mined

Mining of diamonds in Brazil is ac-



GENERAL TERRAIN at the active Campo Sampaio mine contains a concealing ground cover. Among the diamonds recovered in the state of Minas Gerais are: Getulio Vargas, 754 carats;

President Vargas, 726 carats; Darcy Vargas, 460 carats; and Coromandel, 401 carats. Most of the diamonds now mined in Brazil are of gem quality.

complished by one of four methods. On a few scattered concessions, modern equipment, such as small dredges or draglines, is used on the present river channels during low water periods.

"Garimperios," equipped with a small pouch strapped to their shoulders and around the waist, win diamonds from the present rivers by diving to the sand-gravel bottoms, and hand scooping the material into the pouch. The diving takes place during low water but even then it occurs to depths of 25 feet. The better equipped operations usually have a very simple means of supplying air to the divers so that their stay under water can be lengthened. Each pouch load is approximately 1.4 cubic feet; 25 pouches approximate a cubic meter. Some of the richer areas are reported to be worth a \$1,000.00 per-cubic-meter.

A third method of mining in the placer deposits is to work the exposed dry sand-gravels, particularly near bedrock of the present streams, when they are accessible during low water season. The "overburden" sand-gravel is stockpiled so it may be worked during the "wet" or high water season. Removal of material is by pick and shovel. Other than screen-pans, no additional equipment is used.

Modern day hydraulic mining is being successfully used on one soft "massa" deposit where the material disintegrates readily using pressures as low as 50 pounds-per-square-inch. Monitors or giants are used to sluice the overburden to a tailing pond and to send the "massa" (diamond-bearing material) to the mill. The known successful operation

of this kind is the Campo Sampaio Mine, some 40 kilometers west of Diamantina, Minas Gerais, Brazil. Wooden, steel lined flumes are used to transport the ore and waste to their respective destinations.

Recovery of the diamonds from their host of sand, gravel, soft or hard "massa" is not a complex metallurgy such as is common with base metals or industrial minerals. Diamonds being of moderate specific gravity, 3.5, concentrate well purely by mechanical means. Primitively, the Garimperios use various size screens for panning. When the concentrate has gathered at the bottom of the panning screen, a quick complete flip of the pan upon a flat surface dumps its contents such that the black concentrate is now exposed on the top. A knife blade or a small piece of thin sheet metal shaped as a blade is then used to brush aside the heavy minerals of the concentrate to expose any diamonds. Identification of rough diamonds are much like native gold: once they have been observed, their appearance and recognition will never be forgotten. On occasion, broken diamonds will be found, but even then they will display the normal octahedral crystal habit. Most diamonds show few water-worn surfaces and 90 percent of the diamonds produced are of gem quality, commanding a good price.

Recovery of diamonds in Brazil by modern mills is a rarity. Where such do operate, their flow sheet includes trommels, some means of clay-ball disintegration, diamond pans, jigs, and occasionally tables. Most plants have been poorly engineered and under financed with a resulting low efficiency

from the antique and worn equipment. Mills accomplish what the primitive panning does but on a larger scale and with a ratio of as much as 200 units to one. The final step is to hand screen-pan the concentrate and hand pick the diamonds, which, of course, permits excellent stealing opportunities.

Where Stones Are Marketed

Once the diamonds have been obtained, the producers, whether "Garimperios" or operating companies, market their product through legitimate licensed diamond buyers who appraise the stones and offer the normal market prices. These local buyers, mostly merchants and traders, in turn, resell the stones to the few licensed exporters. It is these exporters, usually diamond experts, who grade the diamonds according to size, color, cleavability, quality, etc. and export them to their outlets for cutting in the United States, Holland, England, Israel, and many other countries of the world. First quality polished stones have a dollar market value of \$150.00 per carat for smalls to 0.06 carats, up to \$800.00 for a 2.0 carat stone. Many stones produced in Brazil find their way to foreign markets through the illegal channels that exist to escape the production and income taxes imposed by the Federal Government, which until just recently have been based on dollar value at an official rate of exchange of the Brazilian Cruzeiro. Official decree now permits the taxes paid to be based on the free rate of exchange through the official Banco do Brasil.

THE END



DORRCO FLUOSOLIDS reactors produce gas for contact acid plant and calcine for sponge iron plant from pyrite concentrate; both acid and sponge iron are essential to LPF.



OXIDIZED COPPER is leached with acid and sponge iron later precipitates it from solution. The cement copper and the slime copper sulphides are then recovered by flotation.

Ray Mines Closes Ore to Metal Cycle

Kennecott expands mill with L-P-F circuit then builds new smelter to completely integrate Arizona facilities

Ray Mines Division of Kennecott Copper Corporation has completed a \$40,000,000 modernization program at Hayden, Arizona, that includes new leach-precipitation-flotation (LPF) facilities and a new smelter capable of turning out 250 tons-per-day of 99.5 percent copper anodes. Built by Western Knapp Engineering Company, the new smelter can process 1,000 tons-per-day of combined copper sulphide concentrate, LPF concentrate, and cement copper recovered from leaching caved, underground stopes at Ray, Arizona.

First copper was poured at the smelter last June; it was formally dedicated in November, and Ray Mines then became a fully integrated producer for the first time in its long history. The realization of this event was the culmination of a plan that lay dormant for nearly 45 years.

The LPF expansion to the Hayden concentrator, though less spectacular from the standpoint of capital cost, probably represents a greater engineering achievement than the new smelter. In the LPF plant, Ray Mines hopes to recover an additional 2 pounds of copper per ton of ore over the amount that can be recovered by

sulphide flotation alone. This additional metal is in oxide form and composed of copper sulphates, silicates, and carbonates. Basically, the LPF process simply converts the oxidized copper and some of the silicates to metallic copper which will respond to flotation.

Non-sulphides in Schist

The Ray pit is now mining ore containing slightly less than 18 pounds of copper per ton. The deposit is composed mainly of a schist with intrusions of quartz porphyry and diabase. Oxidation is most pronounced in the schist and porphyry ores which contain a relatively high non-sulphide copper content. These ores provide the major proportion of the feed to the LPF plant. The diabase is relatively unoxidized and LPF treatment to improve recovery of copper from this ore is not warranted. The principal copper mineral in the schist and porphyry ore is chalcocite; in the diabase, chalcopyrite is the main copper mineral. Non-sulphide copper minerals account for approximately 20 percent of the copper in the schist ore.

Recovery of non-sulphide copper

minerals at the old Hayden concentrator was low. These minerals include cuprite, copper silicates, tenorite malachite, and native copper. Apparently, sulphide flotation practice at the concentrator made a reasonable recovery of cuprite. The LPF process was developed to recover the remaining oxides. Early test work indicated that the average schist type ore at Ray contained 0.27 percent non-sulphide copper from which an additional 2 pounds of copper could be recovered per ton of ore.

Advantages of Plants

The new LPF plant and smelter make it possible for Kennecott to treat lower grade ores, and this, in turn, will extend the productive life of the Ray property. The new installations were tailored to meet exactly the requirements for efficient and maximum extraction of copper from the ore. They will also permit a 50 percent increase in output from the Ray pit and a 40 percent increase in blister copper production over the 1956 rate. (The 10 percent difference is accounted for by the mining of lower grade ore.) By completion of the processing cycle



NEW COPPER SMELTER at Hayden required an expenditure of about \$20,000,000; it provides 142,000 square feet of working space. The erection of the plant required 7,243 tons of

steelwork and 30,400 yards of concrete. Site preparation, plant construction and installation of the machinery for the smelter took 1,600,000 man hours of labor.

from ore to metal, Ray Mines Division will be better equipped to meet world competition in sales of copper.

The LPF process was first tested by pilot plants at Kennecott's Western Mine Division's Research Center in Salt Lake City, Utah. The encouraging results led to a decision to modify the Hayden mill to provide for an LPF circuit. Western Knapp Engineering Company was awarded a contract to make this expansion at the Hayden mill in August 1955. Construction started in November of the same year and the plant was completed and in operation in February 1957. Proof of success of the venture is recorded by the fact that prior to LPF treatment, normal recovery of copper in the sulphide circuit alone was about 80 percent. Following completion of the LPF circuit, concentrator recovery of copper went up to over 89 percent in 1958.

The LPF plant is most unique and is the second of its type in the world

(the first is at The Anaconda Company's reduction plant at Anaconda, Montana). The basic raw material for the LPF plant consists of pyrite recovered from the tailing of the sulphide section of the Hayden concentrator. The pyrite is extracted by flotation and is then roasted in Dorco Fluosolids reactors to produce an SO_2 gas and an iron oxide calcine. The gas is used to make sulphuric acid in a 100 ton-per-day contact plant, and the calcine is reduced by coal to sponge iron in gas-fired furnaces at a rate of 60 tons-per-day. The sponge iron and acid facilities were built north of the mill. The LPF circuit was added by extending the Hayden concentrator.

In the Hayden mill, a sand-slime separation is made on the crude ore discharged from rod mills at the head of the sulphide and LPF circuits. The sands are leached in drums, washed to remove copper sulphate and excess acid, and then ground in ball mills for

conventional, alkaline, copper sulphide flotation. The slimes are leached in a tank with the acidic, copper-bearing pulp overflowing the washing classifiers in the sand leaching circuit. Make-up acid is added to the slime leach tank as necessary to maintain a pH of 2.0 to 2.2. The leached slime pulp, containing copper in solution and copper sulphide slimes, reports to precipitators.

At this point an excess of the sponge iron is added to drop the copper from solution. The finely divided cement copper and copper sulphide slimes are then floated in an acid circuit. The LPF concentrate and the concentrate recovered in the alkaline sulphide circuit are then joined and pumped to the smelter approximately $\frac{1}{2}$ -mile north of the mill.

Sponge Iron Is Essential

The LPF circuit requires close and careful manipulation. The successful

application of this process is dependent on the use of an excess of minus-35-mesh sponge iron which can be carried right through the flotation circuit. The unconsumed portion is recovered by employing magnetic separators on the flotation scavenger tailing of the LPF circuit. As long as an excess of iron precipitant is available during flotation, resolution of copper is prevented. In addition, the acidity of the flotation circuit can be adjusted for optimum copper recovery conditions rather than for minimum resolution of copper.

Though the LPF process is not new, it hasn't enjoyed wide commercial application principally because of former difficulties in obtaining a finely divided sponge iron which could be transported through the flotation circuit. "Tin" cans or shredded iron are effective copper precipitants, but since it is impossible to carry them through flotation an excess of these materials can not be used. As a result, the precipitating reaction resulting in cement copper tended to reverse itself during flotation. A finely-divided sponge iron is essential to the LPF process.

New Smelter

The new smelter is located at Hayden about ½ mile north of the concentrator. Construction started in July 1956. Two years later in July 1958, the first shipment of the 700-pound copper anodes took place. The major components of the smelter include: (1) a concentrate filtering plant and storage areas; (2) the silica crushing plant

and storage bins; (3) a reverberatory furnace that measures 120 feet long, 35 feet wide and 28 feet high; (4) two waste heat boilers, each capable of producing 65,000 pounds of steam per hour; (5) two converter aisle cranes with 60-ton main hooks and 25-ton auxiliary hooks; (6) three converters, each measuring 13 feet in diameter by 30 feet long; (7) two anode furnaces; (8) anode casting wheel and shipping floor; (9) the smelter power plant with a 9,375 kilowatt generator; (10) conveyor systems, electrical controls, dust collecting system and a 600-foot high smoke stack.

The sulphide concentrate from the conventional alkaline circuit and LPF concentrate are pumped to the filter plant at the smelter. Cement copper recovered by leaching operations at the Ray mine is delivered by rail to the smelter. In the filtration plant, disc filters remove most of the excess moisture, leaving a cake with an approximate 9 percent H₂O content.

The concentrates and the cement copper are fed to the reverberatory furnace, together with a limestone flux. Continuous smelting takes place at 2,600° F. in the gas-fired reverberatory furnace. The reverberatory slag is tapped into 40-ton train ladles for transporting to the slag dump. The matte tapped from the furnace flows into 20-ton capacity ladles. These ladles are picked up by the 60-ton converter-aisle cranes and emptied into the converters.

Each of the three converters holds an average charge of 65 tons of liquid matte. They are equipped with auto-

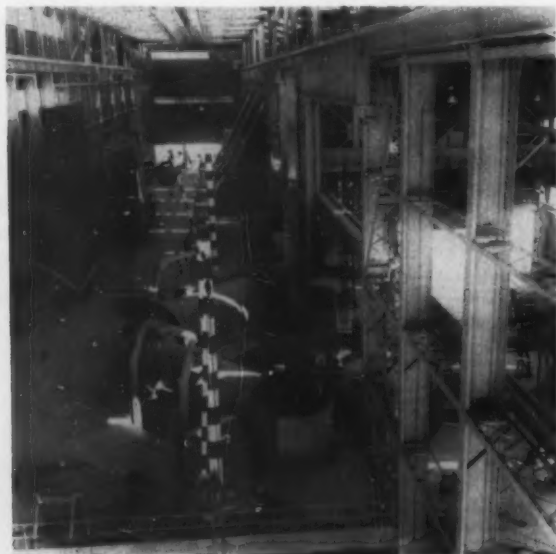
matic tuyere punchers to keep the nozzle openings clear of clogging matte. Measured amounts of fluxes are added to the converter to insure uniform oxidation of the charge material. The blowing process in the converters burns off sulphur and volatiles. The iron in the matte is slagged as a silicate. This iron slag, containing a small amount of copper, is returned to the reverberatory furnace. The blister copper produced in the converter is carried in 20-ton ladles to the anode furnaces.

The blister copper contains both copper metal and copper oxides. The oxides and small quantities of waste materials are removed by poling. In this process, oak logs are inserted into the anode furnace, and their rapid oxidation burns off the excess oxygen and other waste. After poling, the copper is maintained at molten heat until it is ready for casting.

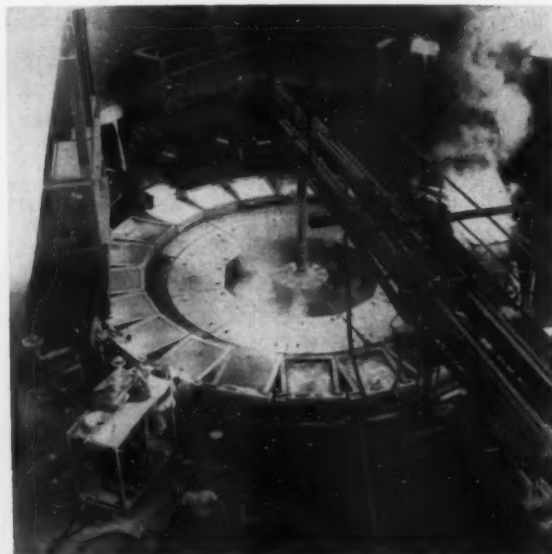
The anode casting wheel can handle the molten copper at a rate of 42 tons per hour. It contains 22 molds for formation of the 700-pound anodes. This is the final step in the Ray smelting process. The anodes are shipped east to an electrolytic refinery in New Jersey.

The Ray Mines Division smelter and LPF facilities help continue Kennecott's tradition of increasingly efficient copper production. The completion of the new plants has enabled Kennecott to close the ore to metal cycle after nearly 47 years of continuous production, and now the last pound of copper can be recovered from the ore.

THE END



CONVERTER AISLE at Hayden smelter shows the two anode furnaces in the foreground and the three converters in the background. Copper is transferred by 20-ton ladles.



CASTING WHEEL is reversible so that copper can be poured and cast from either anode furnace. The capacity of the wheel is approximately 42 tons per hour.



MINING SESSIONS drew key technical speakers. From left are: Wing Agnew, U. S. Bureau of Mines; Roger Pierce, consulting engineer; William Anderson, Hecla Mining Company; John Currie, American Zinc, Lead and Smelting Company.

Howard Schmuck, Colorado Fuel and Iron Corporation, Carlos Milner, Jr., Atlas Copco Pacific; and Ray Cowles, U. S. Bureau of Mines. Messrs. Agnew and Currie were chairmen of the session, and the other engineers presented technical papers.

Northwest Convention

Technical Program Features Ground Support

Attendance has grown each year at the annual convention of the Northwest Mining Association in Spokane, Washington, always held the first week in December. One of the chief reasons for this growth is the increasing calibre of the technical papers read by northwest operators. This year's meeting proved to have another series of most excellent speakers covering underground and surface mining, metallurgy, geology, and management. There also were sessions devoted to Canada, the Northwest's future, and the Washington, D. C., scene.

Underground supports were featured at the mining session. William Anderson, Jr., general mines superintendent, Hecla Mining Company, gave an illustrated talk on the use of circular steel arch sets at Silver Mountain Project, Mullan, Idaho. He said, "We feel that it would have been impossible to hold the ground with rigid support. In the process of repairing, we have never found an appreciable void so that we feel we are contending with a plastic mass under great pressure, and we have proven that the yieldable arch principal of support will work in this type of ground." By "this type of ground," he meant the 453.3-foot-wide Deadman Shear Zone where the rocks of the Wallace formation had been sheared and broken into a heavy plastic gougy mass. It took 103 Bethlehem 8-foot yieldable steel sets to penetrate this shear. Constant repair is necessary to hold the crosscut open.

Ray Cowles, Spokane engineer for the U. S. Bureau of Mines, reported on the development of five- and eight-piece, pre-cast, steel-reinforced concrete drift sets for heavy ground. Each set weighs 2,500 pounds and has the advantage of knee-action free-rolling joints for maximum load transfer without failure.

Roger Pierce, consulting mining engineer, Salt Lake City, Utah, reported that equipment already in use at

the Bardon shaft (see MINING WORLD, December 1958, pages 37 to 39), together with pre-loaded rounds and folded steel sets, would make it possible to sink small shafts 20 to 30 feet per day. He forecast a complete round every two hours, and eventually every hour, in a drift heading using a train car loader and a gantry jumbo. The one big problem left to overcome is gas and smoke in the face after blasting, he added.

"The science of rock bolting isn't standing still," reported Howard Schmuck, Colorado Fuel and Iron Corporation, Denver, Colorado. Today $\frac{3}{4}$ -inch bolts, T-slot holes in washers, 10-inch-long threads, $\frac{3}{4}$ -inch-thick washers, embossed washers, and resin bonding of bolt to rock are some of the latest developments.

Canadian speakers included, William H. White, professor of economic geology, University of British Columbia, who reported that "all copper deposits in Highland Valley, British Columbia, are along a major north-south shear zone." He advised to look for ore in the younger intrusives (explosive breccias etc.) in this zone.

A series of revealing transportation costs for exploration and mining were reported by N. Gritzuk, manager transport division, United Keno Hill Mines, Ltd., and Cassiar Asbestos Corporation, Ltd. It will cost you \$1.60 per ton mile for fixed wing aircraft, \$7.00 per ton mile for helicopters, \$0.65 to \$1.00 for winter transportation by tractor and sleigh, and \$0.30 to \$0.35 for multiple tractor train winter hauling.

Three lines of action for the United States mining industry to take for economic strength were recommended by Royce Hardy, assistant secretary, Department of the Interior. He recommended more exploration, increased research, and consultation with foreign nations "to achieve a greater degree of stability in our markets." He said that

Random Shots Taken at the Convention



KEY SPEAKERS welcomed by program chairman, E. C. Stephens, right. Dr. John Covey, director of mines, Ottawa, Canada is at left with Royce Hardy, assistant U. S. Secretary of Interior.



URANIUM AND PHOSPHATE are discussed by Dr. Garth Thornburg and James Poulos, Lakeview Mining Company, Oregon; and Charles Sweetwood and Joe Jemmett, J. R. Simplot Company, Idaho.



AMBROSIA LAKE mining methods are discussed by L. T. Postle, Granby Consolidated Mining Company, and Roger Pierce, consulting engineer. Both were in New Mexico before meeting.



UNITED STATES AND CANADIAN mining views are exchanged by A. M. Park, Bunker Hill Company; J. R. Reynolds, Rare Metals Corporation; and Thomas Elliott, British Columbia Chamber of Mines.

the Office of Mineral Exploration, the successor to the Defense Minerals Exploration Administration, should issue final regulations in a few weeks. However, he cautioned, "The criteria will be somewhat harder to meet, and this is due to the fact that there is no longer a strong emphasis on defense." Mr. Hardy then outlined the primary purpose of the new program, "to share with private industry the risks involved in carrying out those projects which have good potential but which probably would not be undertaken with private capital." The industry awaits final decision on this. Will the controversial "pauper's oath" apply under this plan? One observer commented that this definition sounded more like prospecting to him than development.

Speeding patent applications was reported by Charles P. Mead, assistant director, Bureau of Land Management. He reported, "At the present time, most of our State offices are handling patent applications on a current basis. In the last three years, patent applications pending have been cut from 706 to 547, 482 new applications filed, and 426 patents issued." He reaffirmed the principle of claim location and patenting in the case of Castle vs. Womble, (December 5, 1894) where "a valid discovery within the limits of a claim contains valuable mineral in sufficient quantity to warrant a prudent man in the expenditure of his time and money in the effort to develop a paying mine."

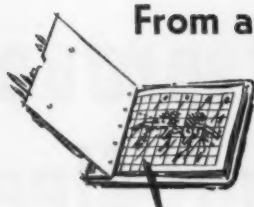
Biggest problem of commercial development of the seven presently known pre-Cambrian iron deposits (taconite) in Montana is transportation cost, reported Donald W. Lindgren, chief mining geologist, Northern Pacific Railway. He said that the deposits had an indicated tonnage from 750,000 to 200,000,000 assaying 25 to 35 percent Fe. Total reserves are in the neighborhood of 410,000,000 tons. All these deposits are in the southwestern part of the state.

Outstanding achievements of Wallace G. Woolf, vice president in charge of the Kellogg, Idaho operations of the Bunker Hill Company, were cited with a special plaque. Written on the plaque was, "For outstanding achievement in non-ferrous metallurgy and as an outstanding metallurgical engineer, operating official, and executive."

Clay production is "potentially the fastest growing mineral industry in Idaho," reported E. F. Cook, director, Idaho Bureau of Mines and Geology. "I predict that within 10 years the production of clay in Latah County alone will be valued at over \$4,000,000 per year," he added.

Officers reelected were E. K. Barnes, Spokane banker, president; Ross D. Leisk, Spokane consulting engineer, vice president; J. B. Haffner, also a Spokane consulting engineer, vice president; Frank N. Marr, Bunker Hill lessee, treasurer; and David E. Watson, Thomas Consolidated Mines, Inc., secretary.

The End.



From a Geologist's Notebook

How Alaska Lists All Prospects

Phil R. Holdsworth, Commissioner of Mines, Territory of Alaska, recently described his department's records on Alaska mineral deposits and stated that many exploration managers rely on the card catalog as a basis for planning an entire field session in Alaska. How, we wondered, can a man expect to spend 4 or 5 days in Holdsworth's Juneau office and lay out an entire season's exploration program?

The form reproduced on this page is an unfolded facsimile of a 3-page card on which is recorded all available information on more than 7000 properties in Alaska. Another group of cards is used as cross references so that a mineral property can be located in files under the owner's name, the claim name, the commodity and the recording district or quadrangle in which it occurs. Correspondence and claim data are also filed by the same system. By using a common method, it only takes minutes to make available related information on a specific property, or specific area, or specific commodity. The department also maintains, for reference purposes, a library of all U.S. Geological Survey and U.S. Bureau of Mines publications pertaining to Alaska, a file of topographic, geologic and mine maps, and a file of land status maps by the Bureau of Land Management. A large number of private and departmental engineers reports are on file, which under certain circumstances, can be studied by other examining engineers. Thus, in Juneau there is available nearly everything known about the mineral deposits of Alaska.

Needless to say there is an impressive bulk of material, but sheer quantity is not necessarily a favorable recommendation in mineral exploration, so let us examine with a skeptical eye what this meticulous system can do for the planner of mineral exploration or the field geologist.

We will assume the fictitious identity of an exploration geologist for a private syndicate interested in metallic resource development. There is called to our attention that nickel deposits are found in southeast Alaska. We assign a geologist to dig from the literature all information available on nickel. Fortunately, there comes to his attention that this work has already been done by the Department of Mines in Juneau. By correspondence, we verify the existence of the reported card catalog etc., so we visit the Territorial Department of Mines office and disclose our quiet interest in exploration for nickel deposits.

A preliminary discussion with Department personnel directs attention to the islands and mainland of southeast Alaska. Department is able to pull from its files all of the cards concerning nickel. (As an example of what could be found on a card, fictitious data has been entered on the facsimile illustrated.) Here, for example, is a group of six claims located on Davison Bay on Chicago Island. Study of the cards indicates that this is one of a dozen similar deposits, in the same geologic setting—(pentlandite-chalcocopyrite-pyrrhotite deposits in noritic intrusives). Considerable prior interest is recorded on the cards and we are put on our guard lest the possibilities be already worked over by major companies such as International Nickel. We note there are at least five U. S. Geological Survey publications which touch on the subject and describe in some detail a number of the deposits.

Taking the file cards made available to us, and a convenient map such as that of the Tongass National Forest, we closely locate the known deposits. The cards indicate the U.S.G.S. coordinate, the number of the quadrangle. We are told that to plot the deposit we should measure in inches and tenths from the southwest corner.

We note that fictitious deposit is considered to be well explored and to consist of restricted lenses with a low metal content and an intimate intergrowth of nickel and copper. This suggests to us a metallurgical problem and we see in a different place on the card that a metallurgical problem was encountered and this is the listed reason for the property being idle. We also note that the property is considered to be in a belt favorable for other occurrences.

By the time we have gone through all of the cards on the subject, and have followed up leads from these cards as to

general geology, prospecting activity in the last several years, and ownership of those deposits considered in the past to be of greatest interest, we are able to summarize our information into a recommendation for action by our company.

Going now from the fictitious to the actual, geologists familiar with Alaska in general, will recognize the work of the Department of Mines as a wonderful step towards encouraging and assisting the difficult task of mineral exploration. It is our feeling that such a compilation will be of particular value to smaller exploration groups whose interests have not in the past led them into Alaska, and who therefore, do not have the familiarity with terrain, operating conditions, known deposits, and the exploration history that the half a dozen "old timers" have accumulated.

As kept in Juneau, the records are not a static but a dynamic living thing. They offer a starting point for prospecting, exploration, property appraisal and mine development, but lest anyone feel that Holdsworth's system is going to hand them a new mine on a silver platter, let's keep in mind that the record of the past is just a starting point for ventures into the future. Good work, Phil!

JUNE HOLDSWORTH, Alaska Nickel, Ltd.,		JUNE ADDRESS: Davison Bay, Alaska	
JUNE OFFICE: 1234 5th Street, Chicago, Illinois			
OPERATING SPECIALS IN CHARGE: John Jones		TITLE: Manager	
DATE DEVELOPMENT STARTED: 1954		DATE: 6/2/55	
DATE PRODUCTION STARTED: -		REASON FOR WORK STOPPED: Metallurgical problems	
ALSO A LISTED - TITLES AT			
Holds exploration option from owner. Terms not of record			
SUMMARY			
Property developed 1917-1922 - workings ceased. Recent work all from surface			
YEAR	OWNER	CLAIM NAME	TYPE OF OPERATION
1957	F. H. Norton	Flamingo 1-6	2. 1. Shallow drilling
OPERATORS			
1957	Alaska Nickel, Ltd.		
1917	Alaska Nickel Company (no connection)		
OTHER PERSONS HAVING KNOWLEDGE			
International Nickel Company (Ontario)			
Dr. Tunnell Terry (621 Bay Road, Toronto, Ont.)			
LAND STATUS OTHER DATA			
Owner holds 6 unpatented lode locations			
REPORTS			
REASON	DATE	FILE NO.	REFERENCE
complete report in U.S.G.S. Bull. 926-1	1-16-17	International Nickel	57
U.S.G.S. Bull. 926-1			136
U.S.G.S. Bull. 926-1			
U.S.G.S. Bull. 926-1			
GENERAL REFERENCES			
FILE NO.	REFERENCE	FILE NO.	REFERENCE
U.S.G.S. Bull. 926-1	1-16-17	International Nickel	57
U.S.G.S. Bull. 926-1			136
U.S.G.S. Bull. 926-1			
U.S.G.S. Bull. 926-1			
MINERAL ASSOCIATION			
USE MINERALS	SOIL TESTING ETC.	ASSOCIATED ROCK TYPES	TESTS
Pentlandite	Pelagopros and pyroxenes	Horites intrusive	See U.S.G.S. reports
Chalcocopyrite		into meta-greywacke	none available
Pyrrhotite		and greenstone	See Nickel 1922
REMARKS REQUIRING ATTENTION			
Pecora regards outcropping deposits as well explored. deposits restricted lenses, low metal tenor, intimate intergrowth Ni/Cu. Property in belt favorable for other occurrences			
SEE FILE: 5176A	1954: CHICAGO OFF	1954: CHICAGO OFF	1954: CHICAGO OFF
1954: CHICAGO OFF	1954: CHICAGO OFF	1954: CHICAGO OFF	1954: CHICAGO OFF
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- **Bonus-powered**, with a 335 hp high-torque turbo charged diesel engine to beat steep grades and high altitudes with full payloads!
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98.5 work availability through one measured 12-week period is the mark set by a 10-unit “95” Payhauler fleet—high-balling rock over steep High Sierra grades, on mammoth Pool Hydro Project, for Southern California Edison Co. Such records result from reserve power, reserve frame and transmission strength, and reserve shock-resistance!

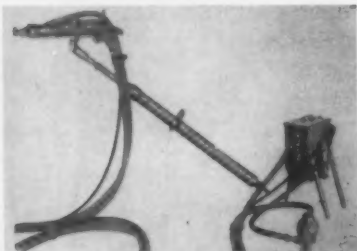
Another thirty “95” Payhaulers join Merritt-Chapman and Scott fleet!

Merritt-Chapman and Scott Corporation has added thirty more “95” Payhaulers to their Niagara Power project equipment spread. Now, the M-C and S Payhauler fleet totals 62 units—largest in the world! On St. Lawrence Seaway, huge Glen Canyon dam, and Niagara Power Project, M-C and S have proved rock-lugging, grade-beating Payhauler performance—and confirmed their satisfaction with repeat orders.



PRODUCTION EQUIPMENT PREVIEW

PEP is just what new equipment, increased mechanization, and new methods can give to your mine, mill or smelter. This PEP section is MINING WORLD's way of making available to you some of the finest current information on mechanization.



Le Roi Dustless Jack Leg Drills Without Water

A dry, dustless jack leg drill, eliminating the need for water in drilling and providing a continuous ore sample, is now available from the Le Roi Division, Westinghouse Air Brake Co. Cuttings are drawn through the bit into the chuck, immediately out the side of the chuck housing and collected in the dust collector tank. The tank door can be operated remotely from the drill throttle valve lever which allows a large number of holes to be drilled without emptying the dust tank.

The LX-1 remote controlled dust collector tank weighs 45 pounds, is 13 $\frac{3}{8}$ " x 7" x 16", and has a venturi air consumption of 18 c.f.m. at 80 p.s.i. The dust collecting drill is for use with Le Roi A190 or A192B air legs. Detailed information is available. Circle No. 20.



Flow Density Measuring System by AccuRay

The AccuRay system gives a continuous, accurate measurement of slurry density. Manufactured by Industrial Nucleonics Corp., the AccuRay is based on the principles of gamma ray transmission from a radioisotope, and makes no physical contact with the flowing material. Measurements are also independent of flow rate and pressure.

The measuring head of the AccuRay Density System is constructed of heavy corrosion resistant meehanite casting welded on a section of pipe. The unit is designed with maximum stability and ruggedness to withstand shock and vibration under the most adverse industrial

conditions. Pipe sizes from 3" to 8" are standard; other sizes are available on special order. A descriptive bulletin is available which furnishes complete information on the AccuRay continuous flow density system. Circle No. 21.



New Joy Sheave Block Is Forged, Easy to Open

Forged alloy steel construction of all major parts except the wheel and a new opening mechanism are major features of a new line of sheave blocks by Joy Manufacturing Company.

The forged parts not only provide ruggedness to prevent shattering, cracking and springing of side plates but also are a safety feature, according to Joy. Under extreme overloads, the hook will not snap off; but when overloaded at three times rated capacity it will begin to straighten and conditions can be remedied. The block is opened simply by turning the hook 90° and pushing it aside. This design eliminates toggle pins, chains, bolts, nuts and cotter pins. For more information circle No. 52.

First Dipper Dredge In 25 Years By Ellicott

The first modern dipper dredge built completely as such in nearly 25 years was finished recently by the Ellicott Machine Corp., it was announced recently. Constructed for the American Dredging Co. of Philadelphia, the "PRESIDENT" features several highly individual design items, greatly facilitating operational efficiency. Not simply a dry-land machine mounted on a barge, the dredge is designed in its entirety as a marine excavator. Of six cubic yard capacity, it is engineered to dig to a depth of 47 feet and will excavate blasted rock, boulders, compacted clay, and similar materials. The dredge can deliver the dredged ma-



terial into dump barges moored alongside within a normal reach of 58 $\frac{1}{2}$ feet and at a clear height from the water level to the bottom of the open dipper door of 16 $\frac{1}{2}$ feet. The dredge's boom is 60 feet long. For more information write company at 1627 Bush St., Baltimore, Maryland.



No Greasing Required On A-C Truck Wheels, Idlers

Allis-Chalmers announces that greasing by the user is no longer necessary on their Positive Seal truck wheels, front idlers, and support rollers for their entire crawler tractor line. These wheels are lubricated at time of assembly and need no further greasing attention. The company states that this is an added operating advantage which now makes possible complete elimination of greasing the tractor undercarriage regardless of mud, water or other adverse operating conditions. For the whole story write: A-C Manufacturing Co., Tractor Group, Milwaukee, Wisc.



1 1/2-Inch Extension Steel For Air Track Equipment

Atlas Copco has announced the introduction of 1 $\frac{1}{2}$ -inch Sandvik Coromant cold rolled extension drill steel for air track equipment to the mining market. Company spokesman said the new deep-hole steels feature the patented "rope thread" which simplifies uncoupling, easy even after sustained drilling. Its rounded form reportedly eliminates thread and coupling failures frequently found in reverse buttress or "saw tooth" threads. Design improvements have also eliminated the semi-bridge in the couplers, reducing coupling splits. A principal cold rolling advantage is that steels are given a tough core with a hard surface, making possible re-threading steels on ordinary metal lathes without heat treatment. For more information, circle No. 49.

HOLES UP TO 3500 FEET are possible with the new Boyles Bros. Ltd. BBS-2UG diamond drill, designed specifically for deep underground drilling. The drilling unit, less swivelhead, can be moved from level to level in a five foot cage and can be moved under its own power in drifts or crosscuts. The BBS-2UG will pass up to 3½-inch O.D. tubing for large hole drilling. Circle No. 35 for descriptive bulletin.

4½ CUBIC YARD Shuttle Dumpers by Aveling-Barford, Grantham, England feature two-way steering, so operator can always face direction of travel. For use either above the ground or underground maximum speed can be attained in either direction. Circle No. 36 for your copy of descriptive catalog number 1703.

CABLE SPLICERS: The American Mine Door Co., Canton, Ohio, have now available for you a new booklet describing their complete line of cable splicers, binders, and terminals. Much valuable information is contained in the booklet, and you can get your copy by circling No. 37.

CHAIN SAW BULLETIN describing the Vulcan Iron Works Co., line of Portocut electric and compressed air operated chain saws of 20-inch capacity and up. For the full story on these production chain saws circle No. 38.

APEX DESIGNS AND CONTROLS for Krebs Cyclones are featured in a new four-page brochure by Equipment Engineers, Inc., San Francisco. Proper apex discharges relating to classification efficiency of a cyclone in both open and closed circuit applications, cut-away drawings and an Apex Capacity Chart for present cyclone users are covered in this bulletin. Circle No. 39 for your copy.

LABORATORY MACHINERY: Morse Bros., Denver, Colorado, have available for you a new catalog featuring their complete line of lab equipment. Included are descriptions of small jaw crushers, combination crusher and pulverizer units, belt feeders, continuous and batch ball mills, classifiers, and flotation machines. Circle No. 40 for your copy.

MACE SMELTERS: The Mace Company of Denver, Colorado, now have available a 28-page booklet describing their small smelting units. Ideal for isolated operations not having access to custom smelters. Circle No. 41 for your copy.

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A NEW SPECIFICATION sheet describing and illustrating what the manufacturer calls the world's largest portable rotary air compressor is now available. The spec sheet P-114 describes the Le Roi 1200 RD2, a 1,200 cfm machine. For your copy circle No. 30.

A NEW CATALOG published by Simplex Wire & Cable Co. features their C-L-X Sheathed Cable. The catalog, indexed for easy reference, describes the construction features of C-L-X, gives engineering data and test results, describes applications, and gives diameters and ordering information. Circle No. 31 for your copy.

A 96-PAGE, multi-purpose catalog of pictures, information and engineering data on Goodyear Tire & Rubber Company's rims, wheels, tools and rim accessories has just been issued by the firm's Metal Products Division. For your copy circle No. 32.

EARTHMOVING EQUIPMENT carried by Hadfields of England, is featured in a new 23 page booklet prepared by the company. Featuring their whole line of ESCO dippers, dragline buckets, ripper teeth and similar items, the catalog also describes their line of replacement parts and castings. Circle No. 33 for your copy.

OSCILLATING CONVEYORS, a new 24-page book devoted to Link-Belt Company's Flexmount, Coilmount and Torqmount conveyors, is said to describe the most complete line of such conveyors available to industry. Ranging from the lightest to the heaviest capacities, the three conveyors can handle material from 25 t.p.h. to 350 t.p.h. Circle No. 46 for your copy.

LIGHTWEIGHT PIPE CATALOG: As a help to pipe users, Naylor Pipe Company, Chicago has recently published a condensed catalog covering the complete line of the company's pipe, fittings, flanges and connections. For your copy circle No. 47.

AIR MOTOR BULLETIN: Ingersoll-Rand Co., announces a new air motor bulletin featuring over 100 popular air motors in its line. These units cover a power range from 0.3 to 24 hp, with speeds running from 50 to 2580 rpm at rated horsepower. Both Multi-Vane and Piston Motors are listed with complete specifications and dimension drawings. Circle No. 48 for your copy.

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New Protective Bag For Ammonium Nitrate

Ammonium nitrate for field-compounded explosives is now being shipped in waterproof plastic bags. Spencer Chemical Company, which has previously introduced a similar heavy-duty polyethylene plastic bag for use with fertilizer and polyethylene resin, has adapted it as a package for its new "N-IV" grade ammonium nitrate. According to Spencer, the added protection which polyethylene gives to moisture sensitive ammonium nitrate makes it a "natural" for this packaging application. Among other things, the waterproof sack can help to eliminate storage problems since it can be stored out in the open without damage to its contents. Since it is a common practice to add oil directly to the ammonium nitrate in the bag and then store it, Spencer says the plastic bag can simplify mixing, offer greater cleanliness and easier handling than was heretofore possible with paper bags. When oil is added to ammonium nitrate in a paper bag, the bag often becomes soggy and hard to handle. This is not the case with the polyethylene bag, which retains the oil, allowing it to become fully absorbed into the prilled material. In addition, storage is simplified since oil can be added through a small opening in the top of the bag which can then be sealed with tape allowing the bags to be stacked normally. For additional information circle No. 53.

RUGGED CORE DRILLING is no chore for the Acker Hillbilly diamond core drill available from Acker Drill Co., Inc. It is light and lean without fancy extras or troublesome gadgets and is designed for rugged mineral prospecting. Full 360 degree swivel head permits drilling at any angle. The Hillbilly is completely self-contained with power plant, planetary type drum hoist, welded tubular steel skid frame and, when needed, a built-in water pump. A descriptive bulletin is available. Circle No. 27.

WIRE ROPE CONVEYOR SYSTEMS are discussed in detail in a new Technical Report recently issued by Hewitt-Robins Inc. The 32-page report describes and illustrates the three basic systems—rope stringer conveyors, suspended conveyors, and extensible conveyors—using the wire rope principle. If you are planning a new conveyor installation or modernizing your present system the technical data in this report will be most helpful. Circle No. 28.

DIESEL-POWERED JEEP is now available from Waukesha Sales & Service, Inc., Dobbs, New Mexico. Here is a regular Jeep available for underground use. Featured are stainless steel exhaust conditioner and exhaust dilution system, extra filtration and shut-off valve in fuel system, heavy-duty 12-volt electrical system with glow plugs, and the inherent economy and clean-burning characteristics of the 180 DLC Waukesha Diesel Engine. For additional information circle No. 29.

CONTROLLED MILL FEED with the Hardinge "Electric Ear" results in considerable savings in grinding balls and mill liners and increased capacity according to the manufacturer, Hardinge Co., Inc. The grinding sound level in the mill actuates the "Electric Ear," controlling the mill feed for optimum grinding conditions. If mill feed is one of your problems you will want a copy of the Hardinge catalog describing the "Electric Ear." Circle No. 23.

BULK STORAGE BY SCRAPER is the title of a bulletin available from Sauerman Bros., Inc. which has many cost-cutting ideas. Included with the bulletin are several Field Reports on handling materials by scraper. Circle No. 22 for your copy.

PROTECT Your Storage Piles with Compound SP is the title of a new booklet prepared by Johnson-March Corporation. Compound SP, a liquid, when properly applied will produce a thin crust which is tough, durable and resistant to the action of wind and rain. Circle No. 43 for your copy.

B-40 EXPLORER is Mobile Drilling, Inc.'s new multi-purpose drill. The hydraulically-powered B-40 is designed for coring in hard rock formations, and can also be used to auger and bore. This unit is designed to any 1/2-ton carrier. Circle No. 44 for descriptive brochure.

NEW ROLL CRUSHER by Pioneer Engineering features a hydraulic adjustment for final reduction crushing. This also enables quicker change to meet required sizes of material. The 4030 twin roll crusher is said to have increased capacity because of increase in width of roll face of approximately 36%, and a faster rim speed of about 10%. For additional information circle No. 42.

FRICTION-DRIVE MINE HOISTS manufactured by ASEA are described in literature available through ASEA Electric, Inc. Fully automatic operation eliminates the costs of hoist operators, are less expensive to operate, safer, and reduce rope wear according to the manufacturer. Circle No. 25 for the friction-drive hoist literature.

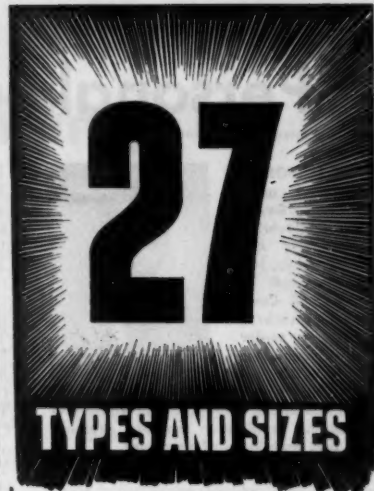
PACKAGED GRINDING plant described in a new Allis-Chalmers Bulletin. An A-C completely aspirated grinding plant featuring a vibrating grinding mill for the processing of a wide variety of materials is described in a new bulletin released by the firm. Circle No. 45 for your copy of this bulletin.

SOLAR JUPITER 500 hp Gas Turbine Engines, is the title of a new brochure published by the Solar Aircraft Co. The brochure deals with the advantages of gas turbine engines in industrial applications, over conventional types of engines. Some of the advantages of gas turbine engines are: high power-to-weight ratio, instant starting under severe temperature extremes, low maintenance, and their ability to burn a wide variety of fuels. For your copy circle No. 2.

DETAILS AND SELECTION DATA on Foote Bros., parallel shaft helical gear drives, with capacities up to 1,550 hp, is available in a new Foote Bros., publication: Engineering Manual MPB. Circle No. 9 for your copy.

ROLLER CLEANER, is a feature on the W. W. Sly Manufacturing Co., new Dynacore Dust Filter. Simple in design, the "Roll Clean" feature cleans dust from filter bags. Rolls automatically adjust to form a positive dust seal as each row of bags is cleaned by atmospheric air. Circle No. 10 for further information and new catalog.

CONTINUOUS VACUUM Drum and Disc Filters manufactured by Morse Bros. Machinery Co. are described in the company's new bulletin No. 5710. For your copy of this interesting and informative bulletin circle No. 19.



27

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Personalities in the News

MORTON H. DORENFELD, formerly associated with Southwestern Engineering Company, Los Angeles, California, has joined the staff of C. F. Braun & Company, Alhambra, California, as senior mineral engineer. Mr. Dorenfeld will work as a member of the Process Engineering Group, doing consulting and economic evaluation on ore dressing and metallurgical processes.



W. W. Little has recently assumed the position of manager of Copper Queen branch of Phelps Dodge Corp., at Bisbee, Arizona. He succeeds C. E. Mills who is retiring from active service with Phelps Dodge.

Dr. Edgar C. Bain, retired vice president of research and technology of United States Steel, was recently awarded the Ambrose Monell Medal for distinguished achievement in mineral technology. Dr. Bain, an internationally known metallurgist, is responsible for establishing the scientific basis of heat treating steel, and was one of the first scientists to use X-ray diffraction techniques in the systematic study of alloys.

Donald H. McLaughlin, president, Homestake Mining Company, San Francisco, California, was elected to membership on the Board of Trustees of the Committee for Economic Development. This committee is a non-profit, non-partisan organization of businessmen and educators who engage in research on national economic problems.

Raymond E. Salvati, president, Island Creek Coal Company, Huntington, West Virginia, has been elected president of the American Mining Congress. He succeeds Howard I. Young, president, American Zinc, Lead and Smelting Company of St. Louis, Missouri. Mr. Salvati, a graduate of West Virginia University, has received a number of outstanding awards from the coal industry, the most recent of which was the Horatio Alger Award in 1958. Mr. Young was honored by the membership and the Board of

Directors for his 25 years of service to the organization. Directors elected were: M. C. Kelce, president, Peabody Coal Co., St. Louis, Mo.; F. S. Mulock, president, U.S. Smelting Refining & Mining Co., Boston, Mass.; C. J. Potter, president, Rochester & Pittsburgh Coal Co., Indiana, Pa.; H. A. Sawyer, president, Lone Star Cement Co., New York; A. E. Seep, president, Mine & Smelter Supply Co., Denver, Colo.; M. E. Shoup, president, Golden Cycle Corp., Colorado Springs, Colo.; H. S. Taylor, president, Oglebay Norton Co., Cleveland, Ohio; C. E. Weed, chairman of the board The Anaconda Co., New York; H. I. Young, president, American Zinc, Lead & Smelting Co., St. Louis, Mo.; Ellery Sedgwick, Jr., president, Medusa Portland Cement Co., Cleveland, Ohio.

The Society of Mining Engineers of the American Institute of Mining, Metallurgical, and Petroleum Engineers has announced that its Robert Peele Memorial Award has been won by Frank R. Jones, mine manager, Stanrock Uranium Mines, Ltd., Elliott Lake, Ontario, Canada, for an outstanding technical paper entitled, "More Rock Per Dollar From the MacIntyre Pit." It describes operations at the MacIntyre Development of the National Lead Co. at Tahawus, New York. The award will be presented at the AIME annual meeting to be held February 15-19, 1959, in San Francisco, and it is administered by the Mining and Exploration Division of the Society.

International Minerals & Chemical Corp., Florida phosphate mining operation, recently announced the promotion of three employees to key engineering and maintenance positions. William Barbarowicz has been named coordinator of engineering design, construction and development; Ray G. Garcia was appointed special projects engineer; and Jack O. Jones was named assistant superintendent of field mechanical maintenance.

J. S. Mitchell resigned his position as manager, Calera Mining Company's Garfield, Utah refinery, to accept a position as superintendent, pilot plant division, Nickel Processing Corporation at Nicaro, Cuba.

Edwin Kennedy, partner in Lehman Brothers, and **Bernard M. Silbert**, president of Pacific Uranium Mines Company, are two new members of the board of Kermac Nuclear Fuels Corporation.

Percy H. Ramsden recently joined the staff of Arivada Development Company in Yucca, Arizona, as chief engineer. This company is developing the old McCracken lead-silver mine in Mohave County, Arizona.

Charles R. Kuzell, retired general manager of Phelps Dodge Corporation, of Phenix, Arizona, has been appointed industry representative on the economic advisory committee for the Arizona Commission of Indian Affairs.

James E. Stocker, former chief electrician for American Smelting and

C. DE WITT SMITH has resigned his position as executive vice president in charge of mining operations for the White Pine Copper Company, Boston, Mass. He will open a consulting practice of his own with headquarters in Boston, Mass. Mr. Smith is a graduate of Yale University; he has been associated with Phelps Dodge Corporation in Arizona; St. Joseph Lead Company in Missouri and New York; and the Copper Range Company in Michigan.



Refining Company at El Paso, Texas, has been named reduction plant maintenance superintendent of the Ray Mines Division, Kennecott Copper Corporation, Ray, Arizona.

Herman E. Bakken, of Pittsburgh, Pennsylvania, vice president of Aluminum Company of America, retired as of October 1, after nearly 40 years of service with the firm. Succeeding Mr. Bakken as manager is J. Randal Fox, former assistant manager.

Robert P. Pearsall Jr., Silver City, New Mexico, mine foreman at the Chino mining division of the Kennecott Copper Corporation, has resigned to accept a sales position with Wedge-Wire Corporation.

Paul Holstein was recently named to the position of safety engineer by the Potash Company of America at Carlsbad, New Mexico.

John T. O'Rourke, former division engineer for Burns & Roe, Inc., New York, has been appointed assistant vice president of Anaconda-Jurden Associates, Inc., in New York.

Carl Claus, former director of the staff division of Babcock & Wilcox Company, New York, New York, was recently elected vice president. Mr. Claus will continue to direct the activities of the staff division.

Theodore J. Green has been appointed Assistant Mine Inspector for the Northern District of Nevada. The new deputy is an experienced miner and millman, previously having been associated with Kennecott Copper Company and serving as contract miner with Consolidated Coppermines Corporation.

The appointment of **DR. C. L. RANDOLPH** as associate director of Chemical Research was recently announced by United States Borax Research Corporation, subsidiary of United States Borax and Chemical Corporation. Included among Dr. Randolph's new responsibilities will be the supervision of all government research activities for U.S. Borax Research Corporation.



JACK H. HOW, president of the Western Machinery Company and Western Knapp Engineering Company, has been elected president of the San Francisco, California Chamber of Commerce. Since his graduation from Leland Stanford Junior University in 1930 Mr. How has been associated with Wemco where he started as a trainee. He is a member of the Mining and Metallurgical Society of America, the AIME, and the American Mining Congress.



Newsmakers in International Mining

SIR HAROLD JEFFREYS, Cambridge University, England, will be a visiting lecturer at the University of Minnesota from April 1 to June 15, 1959, at the School of Mines and Metallurgy and the Department of Mechanics and Materials. Mr. Jeffreys



will present a series of lectures on "Elasticity and its Geophysical Applications," with special reference to recent work in related fields, such as rock flow.

Dr. J. D. Bateman, formerly associated with Ventures Limited and Associated Companies, Toronto, Canada, has established a practice as consulting mining geologist in Toronto.

William Rogers Wade, consulting mining engineer of Marysville, Montana, has been appointed consulting engineer to the Cia. Mineral Buena Vista, S.A., of Havana, Cuba.

F. B. Michell, vice principal of the Camborne School of Mines, Cornwall, England, has recently returned from a professional visit to Malaya. Mr. Michell was elected an honorary member of the Cornish Institute of Engineers.

H. S. McGowan, a veteran of 21 years' service with Ventures Limited subsidiaries, was recently appointed vice president of this company. Mr. McGowan has been associated with the Ventures-controlled Beattie mine at Duparquet, Quebec and the La Luz mines in Nicaragua.

Y. Inayama, managing director of Yawata Iron and Steel Company Limited, and **M. Nakajima**, managing director of Fuji Iron and Steel Company Limited, representing Japan's two top steel industrialists, recently visited Malaya on their way back to Japan after a tour of Europe.

Recently elected to International Mining Corporation's Board of Directors were **Thomas H. McClelland**, vice president of Placer Development, Ltd., International Mining Corp. subsidiary, and **H. Richard Whittall**, president of the Vancouver Stock Exchange.

G. S. MARWAHA, regional inspector of mines for the government of India, has been appointed to the newly created post of regional inspector of mines with special investigation duties in the Department of Mines. During the last two years, Mr. Marwaha



has been engaged in the preparation of the new codes for Indian metalliferous mine regulations, mine rescue rules, and other mining legislation in connection with the Mine Safety Conference organized recently by the government of India.

J. E. Denyer, a director of Anglo-French Exploration Co. Ltd. and the Siamese Tin Syndicate, has been appointed a director of South Crofty Ltd., the tin mine situated at Redruth, Cornwall, England.

P. E. Cavanagh, formerly director of Metallurgy, Ontario Research Foundation, Canada, has been appointed vice president of Premium Iron Ores Limited at Montreal, Canada. Mr. Cavanagh is widely known for his work in iron ore concentration and direct reduction of iron ore.

A three-man survey team, headed by **Chikao Nishikawa**, will be sent by the Mitsui Metal Mining Company, Tokyo, Japan, to South America to conduct a basic study of the development of the copper mining industry there. Mr. Nishikawa is director in charge of the company's mining department. The team will visit Argentina, Bolivia, Chile, and Peru.

A. G. Mosier, former assistant mill metallurgist with the Braden Copper Company in Rancagua, Chile, has recently moved to Denver, Colorado.

HAROLD M. MOONEY, associate professor of geophysics at the University of Minnesota, will visit Switzerland next spring under a grant from the American-Swiss Foundation for Scientific Exchange. Mr. Mooney will lecture at the Institut für Geophysik, Eidgenössische Technische Hochschule in Zurich.



A. P. Van Dyck, formerly associated with Geomines in Manono, Belgian Congo, is now with the Centre d'Information du Nickel in Brussels, Belgium.

Rolf Behncke is presently technical manager at Compania Manganesos Chile in Santiago, Chile.

William Bellano, formerly vice president of International Minerals & Chemical Corporation, has accepted the position of president of the Gulf Sulphur Corporation of Houston, Texas.

Simon V. Dumaguig Jr., field geologist, recently resigned from the geology department of Atlas Consolidated Mining and Development Corporation at Lutopan, Toldeo Cebu, Philippine Islands. Mr. Dumaguig is now with Cebu Minerals Exploration Company in Cebu City.

J. A. H. Paterson, a member of the executive board of the Canadian Metal Mining Association and general manager of Mining Corporation, recently served as one of the three Canadian representatives of the United Nations-sponsored Geneva lead-zinc conference.

E. W. I. Keenleyside has recently been appointed to the Board of Directors of The Photographic Survey Corporation Limited, of Canada. Mr. Keenleyside joined this company, a

FRANK W. MCQUISTON, JR., chief metallurgist with the Newmont Mining Corporation, New York, was appointed to serve as the American advisory member of the Organizing Committee for the International Mineral Processing Congress to be held in London, England, in April 1960. This International Congress of Metallurgists, which is held in Europe every three years, was last held in Stockholm, Sweden, and was attended by delegates from thirty-three countries.



member of Hunting Associates Limited, in November 1949, and has been the Ottawa representative since 1950.

F. Fitzgibbon, who has resigned his position as concentrator superintendent with Nchanga Consolidated Copper Mines, Northern Rhodesia, has been succeeded by **Charles Mehary** of Nkana. **Noel Posselt** has been appointed assistant concentrator superintendent.

Dr. Nobuichiro Kitagawa of Japan has joined the staff of New Mexico Institute of Mining and Technology as a research assistant in the research and development division. **Dr. Mahdi Hantush** of Baghdad will serve as senior hydrologist and professor of hydrology in the same division.

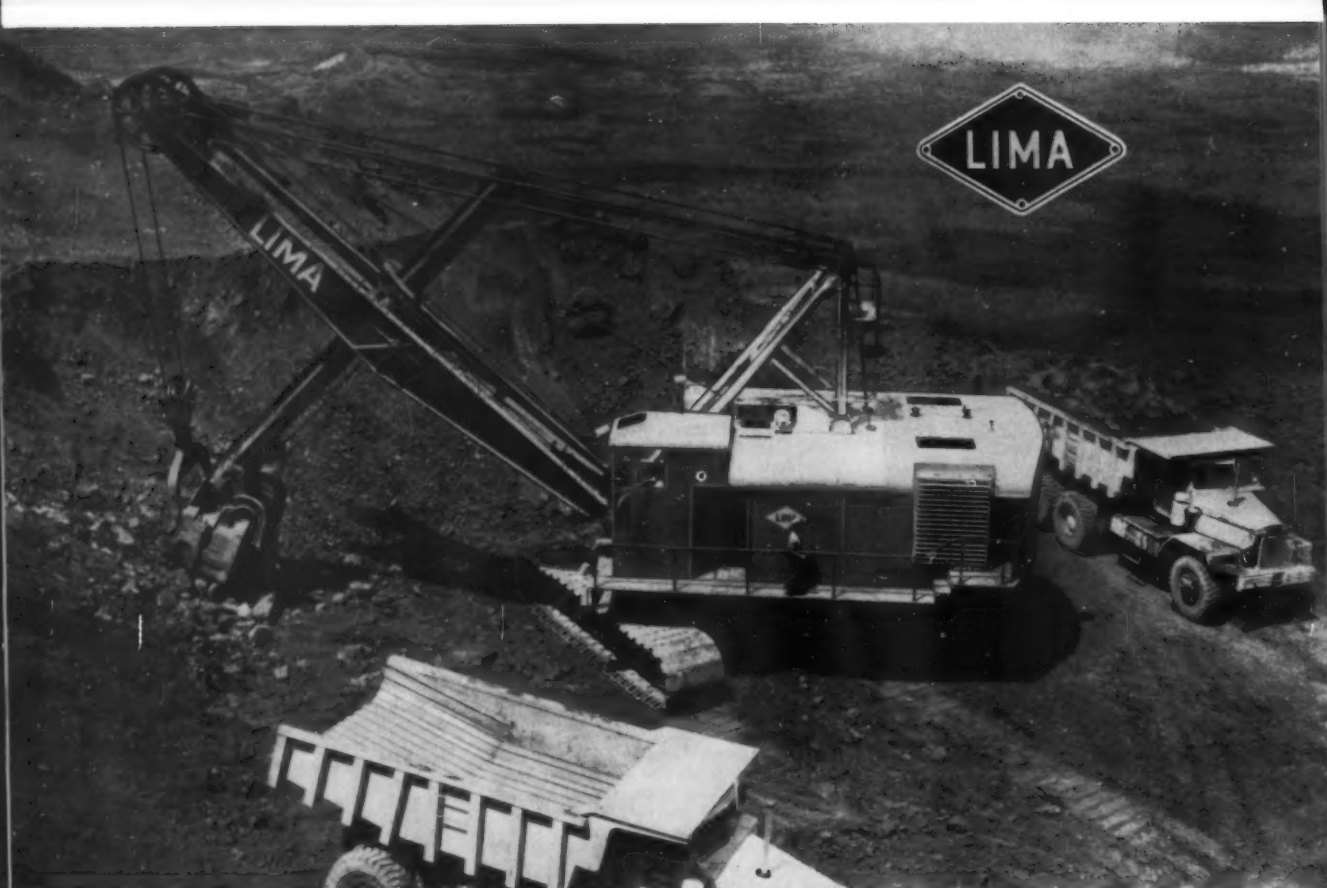
G. S. Giles, general manager at Nchanga Consolidated Mines, Northern Rhodesia, has been promoted within the Anglo-American Corporation and will take over the position of consulting engineer (diamond section) with offices in Johannesburg. **M. W. Rushton**, formerly assistant consulting engineer (Rhodesian section), has taken over Mr. Giles' duties as general manager at Nchanga. Other Nchanga appointments were: **A. R. Harrison** to chief consulting engineer; **H. Smith** to assistant consulting engineer (Rhodesian section); and **R. A. Mudd** to acting assistant consulting engineer (East Rand section).

Roger McConnell, chief geologist for the Bunker Hill Company, was recently in Brazil to make a preliminary study of the non-ferrous metals potential of that country.

KUNO DOERR, JR. has been named president and general manager of Southern Peru Copper Corporation, Lima, Peru. He will succeed **EDWARD MCL. TITTMANN**, who is leaving Peru to assume duties as vice president of American Smelting



and Refining Company, in charge of smelters and refineries. Mr. Doerr has been employed with American Smelting and Refining since graduation from the Colorado School of Mines in 1927.



Powerful Lima 2400, with big 6-cu. yd. dipper, excavates and loads iron ore high on this mountain in Venezuela.

Now show more profit...put Limas on jobs demanding high output, low cost!

Limas tackle the toughest jobs the world over. And the biggest and toughest of all the Limas is the Type 2400, a convertible 6-cu. yd. shovel, 110-ton crane, and variable capacity dragline.

Maintenance 5 cents an hour

One operator says, "... Our Lima does more work and costs less to maintain than other makes of similar capacity ... in about 6000 hours of rugged stripping operations, maintenance and parts have amounted to less than \$300—actually less than 5 cents an hour. Seems as if you just can't wear a Lima out!"

All major operations on the 2400 are accomplished by air-actuated clutches. Its diesel engine is equipped with torque converter to reduce shock load-

ing and eliminate engine stall. Converter gives operator smoother, more accurate control for faster swings. Longer booms and handles can be added for high-lift shovel work.

No matter what your job requirement, there is a Lima exactly right for your needs. Limas are built throughout for heavy duty service. If you want to strip, dig or load more ... at a lower cost, compare quality before you buy and you will choose a Lima! Cranes to 110 tons, shovels 1/2 to 6 cu. yds., draglines variable. Choice of power plants and crawler, truck or wagon mountings.

To get full information on the Lima that will profit you most, see your Lima distributor today—or write to us.



Lima Type 604 loads Minnesota iron ore with 1 1/2-cu. yd. bucket on 23-ft. boom, 18-ft. dipper handle.

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IDAHO

Deepening of the main shaft of the *Galena* mine west of Wallace, Shoshone County, Idaho, 600 feet to a total depth of 4,000 feet has been undertaken by the operating company, *American Smelting & Refining Company*. The work was started on a two-shift basis, with ore production continuing as usual. From the new 4000 level, a crosscut will be driven southerly to connect with a winze which was sunk on the mine's silver-copper vein. The new 4000 level will be more than 1,200 feet below sea level, a horizon exceeded only by the *Sunshine* and *Bunker Hill* mines in the Coeur d'Alene mining region. J. C. Kieffer is manager of Asarco's Northwest mining department.

Black Bear Silver-Lead Mines Company is exploring a lead-zinc-bearing structure found by diamond drilling in the *Erin* claim leased from *Coeur d'Alene Syndicate, Inc.* near Gem, Shoshone County, Idaho. Drill holes were being put upward and downward below the main tunnel level, at last report. *Black Bear* is controlled by *Metropolitan Mines*, which is headed by John T. Kingsbury of Wallace.

Lucky Friday Silver-Lead Mines Company is mining about 200 tons of silver-lead ore daily at its property east of Mullan, Shoshone County, Idaho, and also carrying out development work on bottom levels. The firm is reaping a nice profit as a result of stockpiling lead at Asarco's East Helena, Montana smelter, starting last June, when the price of lead was at its lowest 1958 level.

At the *Crescent* mine on Big Creek, Shoshone County, Idaho, the *Bunker Hill Company* is opening a new working level at a depth of 3,000 feet, following a raise from the bottom 3,100-foot level to the 2,500-foot horizon. The new work will open an ore shoot which was more than 400 feet long where discovered on the 3100 level. Values are in silver and copper.

The old Florence road used by gold miners of the 1860s has been graded by *Idaho Mining and Milling, Inc.*, in connection with its proposed dredging program in the Florence Basin of Idaho. Several truckloads of sawmill machinery have been hauled in and timber clearing is underway. A preliminary survey of a proposed airstrip also has been made.

An exploratory tunnel being driven by the *Bunker Hill Company* from its 1,100-foot workings in Shoshone County, Idaho has entered the *Silver Bowl, Inc.* area of interest after being delayed by intersection of a "blind" vein of good lead-silver ore in Bunker Hill ground. The blind vein was explored with fairly good results. The original and current objective was the downward continuation of the Senator Stewart vein which yielded \$15,000,000 worth of ore near the surface in early days.

A \$100,000 development program undertaken at the *Jack Waite* mine on the Idaho-Montana border by *American Smelting and Refining Company* is half completed. Production of lead-silver-zinc ore has been slowed by development

work but 7,200 tons were milled in the first nine months of 1958. The property is in Shoshone County, Idaho, at Duthie.

Day Mines, Inc. has called 10 men back to work at its *Hercules* zinc-lead-silver mine at Burke, Shoshone County, Idaho, but the Wallace firm's base metals operations continue on a curtailed basis.

Sunshine Mining Company has developed about 250 feet of high-grade silver-copper ore of good width in a vein discovered in the footwall of the Chester fault in the eastern part of the Sunshine unitized area. The ore has been developed at a depth of 3,700 feet and a 3,850-foot level drift also has entered the ore zone. Diamond drilling has found the vein at the 4000 level, too. Additional ore reserves also have been developed along the Sunshine-Polaris vein system.

Silver Star-Queens, Inc. is working 16 men on a two-shift, five-day-week basis in Blaine County, Idaho's Mineral Hills district, west of Bellevue. Since a two-compartment winze was deepened to the 900-foot horizon, development efforts have been concentrated on the 850 level. Progress has been hampered by faults which have offset the veins and squeezed winze timbers. Roy T. Filtz is superintendent and general manager.

The old Prichard gold mining district north of Wallace, Shoshone County, Idaho is the scene of a new copper enterprise. The recently organized *Rock City Mining Company* of Kellogg is developing copper showings uncovered by bulldozer stripping. A tunnel has been driven more than 110 feet on one of seven veins. A mill is contemplated for the future. The *Rock City* camp is two miles off the main North Fork River road on Brett Creek above Prichard. In the early 1900s, several barge-loads of copper ore were shipped down the river to Prichard from the area. Robert W. Hunt, Kirkland, Washington, is company president; Wil-

bur Hunt, Post Falls, vice president and manager; James Towles, Kellogg, secretary-treasurer, and Lloyd Coe, mine foreman.

Construction has started on a pilot plant for the *Atomic Energy Commission* at its National Reactor Testing Station in Idaho. *Fluor Corporation Ltd.* of Los Angeles was awarded a \$3,391,700 contract for the construction, total cost of which is estimated at \$6,000,000. The plant is for calcining high-level radioactive liquid waste products. It will be capable of handling one gallon of waste per minute, and will provide prototype experience for full-scale plants. Fluor will construct a waste treatment plant and a concrete storage vault for storing solid plant wastes. Construction is to be completed by January 31, 1960. The process was developed by scientists of *Phillips Petroleum Company* and *Argonne National Laboratory*.

Production at the property of *Sunshine Consolidated, Inc.*, on Big Creek, Shoshone County, Idaho, is about 1,000 tons monthly. *Sunshine Mining Company*, the operating firm, is employing a dozen men in the mining operations. Norman M. Smith is manager of *Sunshine Consolidated*.

MONTANA

At the historic *Granite Bi-Metallic* mine which *Trout Mining Division* of *American Machine and Metals Corporation* has taken over, development work is continuing in order to bring these areas into production. The company has a lease and purchase option on the property which is near its holdings in Philipsburg, Montana. A new shaft has been



Oregon's \$3,000,000 Uranium Mill in Operation

The Lakeview Mining Company's \$3,000,000 uranium reduction plant at Lakeview, Oregon has gone into operation with a capacity of 210 tons of ore per day. Lakeview will treat ore from its leased White King mine, and will also purchase amenable ores from independent producers under terms of its five-year contract with the Atomic Energy Commission. Lakeview acted as its own contractor in construction of the mill. Burr Johnson supervised the work. Engineering plans and design were developed by The Galigher Company of Salt Lake City. Lakeview is owned by Dr. Garth Thornburg and his brother, Vance Thornburg, together with the Murchisons of Dallas, Texas, and the Richardson-Boss partnership of Fort Worth, Texas. The same group owns and operates a uranium reduction mill and mine, the Gunnison Mining Company, at Gunnison, Colorado.



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NORTHWEST

completed at the company's *Trout* mine and new areas have been developed to meet a rising demand for manganese dioxide for dry cell battery manufacture. Production is steadily increasing.

The *Chemical Copper Company* of Three Forks, Montana has a unique mining and processing operation underway in the Copper City district about six miles north of Three Forks. The oxidized copper ore is mined by open-pit methods, crushed initially at the mine, and hauled about one-half mile to the concentrating plant. There, the ore is further crushed and fed to a rotating, rubber-lined, trommel-type leacher, where the copper ore is exposed to the acid leach. From the leacher, the ore is placed on a long, wide, slow moving, deep-troughed belt containing acid for further leaching. The end of the belt is elevated enough so that the solution stays in the trough while the leached material is carried by the belt away from the solution. The waste material then goes to a waste pile. The copper in solution is pumped to tanks and the copper is recovered by replacement with aluminum.

The *Montana Coeur d'Alene Mining Syndicate* operating near Eddy Creek in Montana, reports that it appears to have cut into a quartz lode in the St. Regis formation. The syndicate plans a developing program on this free milling lead-silver ore body. Clarence Davis of Cheney, Washington is president.

Production of gold ore has started from some of the dewatered levels in the old *Mayflower* mine near Whitehall, Montana. Peter Antonioli and associates have been reopening the mine for some months. It was a steady gold producer for a number of years prior to World War II.

At a recent district court action, the trial judge ordered all property of the *Montana Gold and Chemical Company* to be sold at public auction. This company operated a small capacity, bucket line, floating dredge near Gold Creek, Montana. This is the area where gold was first discovered in Montana, and parts of this area have been extensively sluiced, hydraulicked, and dredged in the past 80 years.

WASHINGTON

The *Bunker Hill Company*, big north Idaho mining and smelting firm, has optioned a site on the Columbia River near Kennewick, Washington as a possible location for its proposed \$10,000,000 phosphate fertilizer plant. The land lies between a new \$15,000,000 plant of *Phillips Pacific Chemical Company* and an *Allied Chemical and Dye Company* plant. The Phillips plant manufactures anhydrous ammonia. Bunker Hill makes sulfuric acid as a by-product at its electrolytic zinc plant near Kellogg, Idaho.

Bear Creek Uranium Company has built a shelter over its shaft in the Mount Spokane district of Spokane County, Washington, and made other preparations for continuing mining operations all winter. Ore is brought out of the drifts with a double-drum slusher and scraper, powered by a 315 compressor. Ore is dumped into a steel chute and then into

the skip. Shipments have totaled 575 tons. Oscar Horem of Elk is mine superintendent.

Washington Mining Corporation has been formed by two Washington mining men to develop the *Royal Reward* and *Cardinal Reward* quicksilver mines near Enumclaw, Washington. Larry Berkshire and Ron Ljungdahl made the discovery along the banks of the Green River. They purchased two 40-acre plots and leased mineral rights to another 2,000 acres from a railroad company and a lumber firm. Mr. Ljungdahl is now secretary of the corporation and superintendent of mining operations; Mr. Berkshire is vice president in charge of exploration and development. A 270-foot shaft is to be sunk at the *Royal Reward*, and a tunnel will be driven under the river to tap the vein on the opposite bank. A small pilot retort at the *Royal Reward* has been producing two or three 76-pound flasks of mercury per week, and a 40-ton-per-day furnace has just been installed.

Two Canadian firms are reported to have taken a 20-year lease on the *Old Buckhorn* iron mine in Okanogan County, Washington from *Magnetic Mines Inc.* of Wenatchee. The companies are *Western Stevedoring Company* and *Pacific Quarries Ltd.*, both of Vancouver. Reserves are estimated at 18,000,000 tons. The ore is to be sent to Canada for concentrating, and then shipped to Japan. Initial shipments are to total 80,000 tons during the first year of operation; this will then increase to 300,000 tons in the second year, and to an ultimate of 500,000 tons later.

Sherman Mining Company Inc. of Omak, Washington has sunk a 200-foot shaft on its *Brook* lode claim. In a 150-foot drift, the operators cut a vein from 3 to 5½ feet wide, showing values in silver, lead, zinc, gold, and manganese. Diamond drilling is being undertaken to locate the extension of the vein. On the firm's *Sunshine* claim 4,500 feet above the other claim, a 100-foot shaft has been sunk. A 50-foot drift in this shaft has disclosed gold, silver, lead, and copper. The company has purchased the *American Graphite* mill three miles north of Omak.

The Spokane Tribe of Indians has received more than \$100,000 in royalties on uranium production from tribal lands and members of the tribe have been paid about \$400,000 additional for leases on land owned individually. *Dawn Mining Company*, 51 percent owned by *Newmont Mining Corporation* and 49 percent by *Midnite Mines, Inc.*, has accounted for the bulk of the royalty payments.

The old *Spokane* gold-silver-lead-copper mine at Wannacut Lake, southwest of Oroville, Okanogan County, Washington, has been reopened by *Flaghill Mines, Inc.*, and a four-man crew was at work, at last report. The mine last produced in 1938. Percy Bergt is manager of Flaghill, which also plans to operate a gold property near Republic, Ferry County.

Successful flotation of oxidized zinc ores has been accomplished in pilot plant tests at the mining experiment station, *Washington State Institute of Technology, State College of Washington*, Pullman. Concentrates containing up to 45 percent zinc were produced from ores containing 4 to 6 percent zinc. Recoveries were approximately 80 percent. W. C. Aikenhead is director.

Sauerman News Briefs



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Brief items about the Sauerman Method... Crescent DragScrapers
Slackline and Tautline Cableways... Durolite Blocks

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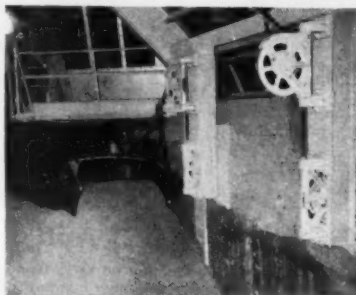


Stockpiling Zinc Residue

Zinc residue from the smelting furnaces of the Meadowbrook Corporation is economically handled by a DragScraper storage machine. About 100 tons of residue are produced daily in the refining processes and the material is carried by belt conveyors to the disposal area. The conveyors feed a swivel spout which forms the initial pile near the head post.

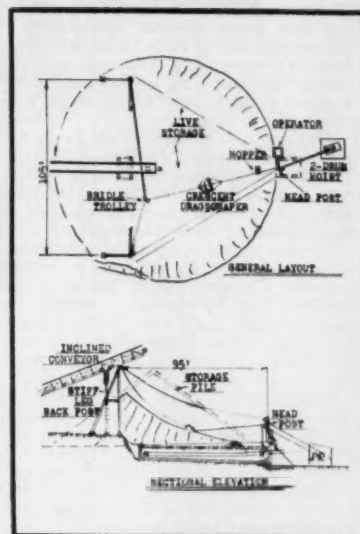
Ample storage capacity is provided by using an elevated bridge system at the outboard side of the disposal area. The elevated bridge cable is supported by two 60-ft. guyed masts about 200 ft. apart. Lateral shifting of the DragScraper is readily accomplished by power-shifting the trolley and tail block to a new position on the bridge cable. The height of the mast permits building a 50-ft. high pile and provides storage for 100,000 yds. of zinc residue for each setup of the tailmasts.

(Condensed from Sauerman News No. 152.)



Reclaiming Material to hopper from all sections of a 500-ft. warehouse, the estimated operating cost of this DragScraper Machine is 2.1 cents per ton. (Sauerman News 145).

Rapid Shifting DragScraper is Engineered to Needs of Silica Sand Producer



The Sauerman Method was successfully applied to the requirements of a prominent silica sand producer, as shown in the drawing above. This Rapid-Shifting DragScraper Machine reclaims raw sand from a 6,000-ton stockpile.

The pile is formed by an inclined conveyor leading from the floor of the quarry to the live storage area. The Crescent DragScraper reclaims from storage to a hopper-fed conveyor in front of the head post.

Before the DragScraper was installed, the raw sand frequently bridged across the hopper. Such interruptions in the flow of raw sand to the plant resulted in costly shutdowns. The Crescent prevents this bridging action and provides a steady flow of material for processing.

The Sauerman Method also permits the company to build up a reserve pile of raw sand sufficient for at least one week's production as insurance against a quarry shutdown.

(Condensed from Sauerman News No. 147.)

MORE NEWS AND INFORMATION

Issues of *Sauerman News* giving greater detail about the installations on this page are available on request. For full information, tell us your interest or requirements and ask for catalog. Contact Sauerman Bros., Inc., 638 S. 28th Ave., Bellwood, Ill.

Drilling and Blasting Discussed at Symposium

Drilling of large diameter holes, determination of economic extent of mechanization for rock excavation, development of a water-compatible type ammonium nitrate, and economics of airleg type rock drilling were major topics discussed at the Eighth Annual Drilling and Blasting Symposium.

Under the rotational policy between the University of Minnesota, Colorado School of Mines, and the Pennsylvania State University, this symposium was held at Minneapolis, Minnesota.

Robert T. McCaul, Ingersoll-Rand Company, New York, New York, pointed out the three general advantages of "Down the Hole" drills to be no energy losses in transmitting drill rods, powerful independent rotation, and ability to drill a more uniform hole under tough rock conditions.

Drilling and blasting practices in Europe were reported by Dr. Karl-Heinz Fraenkel, Stockholm, Sweden, in a paper read by Erik Ryd, Atlas Copco AB, Stockholm. Dr. Fraenkel is editor in chief of the *Manual of Rock Blasting*.

A new water-compatible ammonium nitrate may soon be available to miners, reported Kenneth Ed of the Canadian Institute Ltd. in Montreal, Canada. He said that such slurry type blasting agents had high velocity detonation but were 1.7 times as expensive as regular packaged ammonium nitrate pills.

Cost distribution for airleg drilling is 50 percent for labor, 30 percent for drill steel, 5 percent for compressed air, and 15 percent miscellaneous, reported Mr. Ryd in another paper. These figures emphasized the importance of ease of drill movement and fast drilling compared to drill efficiency, he said.



Meramec Mining Company is well ahead of schedule in its sinking of the Pea Ridge shaft near Sullivan, Missouri. The shaft was down to 1,080 feet by the end of November, when it was not expected to reach 1,000 feet until the first of this year. The \$40,000,000 iron ore project is to be in full production by 1962. Work has already started on the second shaft which will be used to remove the ore when production starts. An ore processing plant will be built at the mine, along with a 200-car freight yard to remove the estimated 100 carloads of concentrate to be shipped each day. The Missouri Pacific Railroad is buying right of way for the 25 miles of new line that must be laid to reach the site.

The name of Cuban American Nickel Company, a subsidiary of Freeport Sulphur Company, has been changed to Freeport Nickel Company. It will operate a nickel and cobalt refinery at Port Nickel, Louisiana. Ore concentrates will come from another Freeport subsidiary, Moa Bay Mining Company, mining in the Oriente Province of Cuba. Freeport Nickel is to produce 50,000,000 pounds of nickel metal and 4,400,000 pounds of cobalt metal annually starting in the summer of 1959.

Matthiessen & Hegeler Zinc Company of La Salle, Illinois celebrated its 100th anniversary in December. The firm was founded in 1858 by Frederick William Matthiessen and Edward Carl Hegeler, two young engineers from the School of Mines in Freiberg, Saxony, Germany.

Eagle-Picher Company has resumed operations at its Henryetta, Oklahoma mine and smelter on a limited basis. John Wade, plant manager, said the mine was shut down last February because of "poor market conditions."

The University of Minnesota's 20th annual mining symposium is to be held at Duluth on January 13 and 14. The Minnesota section of the AIME will meet in conjunction with the symposium. Theme of this year's meeting is "Instrumentation and Controls in Mining and Beneficiation." Among the papers to be presented are: Types and Potentials of Instrumentation and Controls by John Riede; Basic Control Functions by Nathaniel B. Nichols; Control and Instrumentation in Flotation by T. G. Fulmor; Practical Aspects of Controls in a Modern Milling Plant by C. M. Marquardt; Instrumentation in a Shaft Pelletizing Furnace by William Dailey and Arthur Storm; Instrumentation and Controls in Open Pit Mining Operations by E. S. Kuhlmeier and Owen Thompson; Instrumentation and Controls in Underground Mining Operations by Carl W. Anderson; Modern Digital Calculators in Engineering Analysis by M. L. Stein; and Application of Electric Computers to Mining Engineering Problems by Robert O. Moyle.

Baughman Manufacturing Company Inc. of Jerseyville, Illinois has found an unusual deposit in the lower strata of its mine, about 150 feet below the surface of the open pit. Analysis of the deposit has varied, and so the find is, as yet, undetermined. The particles do have the shape of diamonds and have a very high sparkle. Since quarrying is presently being conducted in the rock above this strata, the strata will be exposed on the surface within a short time. G. O. Hoffstetter is general manager.

To reduce hazards of stopper-board type wooden chutes, and to improve efficiency in chute loading, a new type of chute has been installed in the mines of the Calumet Division of Calumet and Hecla, Inc. at Calumet, Michigan. The chute was designed by Safety Inspector J. Sitar to fulfill safety standards worked out by the company and U.S. Bureau of Mines engineer Roger L. Tenney who is stationed in Duluth, Minnesota. It can be made to replace existing chutes without the need for enlarging openings.



New Jersey Zinc Doubles Jefferson City Mill

New Jersey Zinc Company has just doubled the size of its mill at its Jefferson City, Tennessee zinc mine. The mill, which originally had a capacity of 1,000 tons per day, now handles 2,000 tons per day of the premium lead-free zinc found at this mine. In the picture above, the main mill building has been extended (extreme left) to house additional grinding and classification units. In the center of the picture, a second circular steel ore bin can be noted. This was erected to double coarse ore storage. The mine went into full production in 1957. Because of excellent operating results and increased ore reserves, the company decided to expand mill facilities to permit doubling of mine production rate by the end of 1958.

Shipments have started from the Grace mine of Bethlehem Steel Company at Morgantown, Pennsylvania. All surface structures except the concentrate agglomerating plant are completed. The latter will be finished this year. Initial production will be from 800 to 1,000 tons of concentrate daily, which will require a mine output of about 1,500 tons of ore and waste daily. When the mine is in full production, daily output will be from 10,000 to 12,000 tons.

Calumet & Hecla Inc., has acquired a majority interest in the Alabama Metallurgical Corporation of Selma, Alabama.

Brooks & Perkins Inc. holds the remainder of the stock. Ground has been broken for a \$3,500,000 magnesium producing plant at Selma which is to be in production by September 1959. It will produce magnesium for metallurgical purposes. Initial output will be 6,000 tons annually. The magnesium will be produced from dolomite which will come from a company owned deposit of Ryan, Alabama.

The government's new barter program lists 26 minerals acceptable in exchange for surplus farm commodities. This is more than double the old list of 12 eligible minerals, but does not include copper. The 26 materials designated are: crude aluminum oxide abrasives; antimony; asbestos (amosite and crocidolite); bauxite (Surinam, Jamaican, refractory); beryl; (hand-cobbed only); bismuth; cadmium; chromite (metallurgical, refractory, chemical); columbite; cryolite; diamonds and bort; ferrochrome; fluorspar (acid and metallurgical); lead; manganese (commercial and natural grade A battery, type A and B chemical grade); mercury; mica (muscovite block, film and splittings); nickel; palladium; quartz crystals; ruthenium; selenium; silicon carbide; tantalite; tin; and zinc.

The *General Services Administration* has terminated its buying programs for chrysotile asbestos, acid-grade fluorspar, and domestic and Mexican mercury.

Full-scale production is expected next month from the new pilot plant of *HEF, Inc.*, near Columbus, Mississippi. Approximate initial capacity will be 4,000,000 pounds per year. This new process has been jointly developed by *Hooker Chemical Corporation* and *Foote Mineral Company*. It proves that "either ammonium or lithium perchlorate can be produced with equal facility should emphasis be switched to lithium perchlorate in the missile program," say company spokesmen.

Kennecott Copper Corporation will acquire all of the properties, assets, business, and good will of the *Okonite Company* in exchange for shares of *Kennecott* common stock on a share-for-share basis. If stockholders approve the action, a new company will be set up, with the same name, to operate as a subsidiary of *Kennecott*. *Okonite* is best known for its manufacture of premium-grade insulated wires and cables furnished for power transmission and distribution, control and signal systems, and electronic and communication circuits.

Cerro de Pasco Corporation plans to acquire all of the remaining assets of *Consolidated Coppermines Corporation* if stockholders approve. The assets, apart from cash and marketable securities, consist mainly of majority ownership in *The Titan Metal Manufacturing Company* and *Rockbestos Products Corporation*.



Jones and Laughlin Steel Corporation recently awarded a contract to *Western-Knapp Engineering Company*, San Francisco, California, for the modernization of the Hill Annex concentrator at Calumet, Minnesota. The contract involves improvements in processing methods for iron ores from the Hill Annex group. Wil-

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CENTRAL AND EASTERN

liam Ball is superintendent of the Hill Annex mine and Russell Abercrombie is plant superintendent.

Though final shipping figures are not available at this writing, it is estimated that 55,000,000 tons of iron ore were handled on the Great Lakes this past season. Some of the remaining vessels of Pittsburgh Steamship Division continued to operate after most of the others had made their final trips because of an increase in steel mill requirements for iron ore and limestone. Last year 84,600,000 tons were hauled on the Lakes. A substantial stripping program is scheduled by all companies during this winter and the general outlook indicates considerable production increase in ore shipments for 1959.

Northern Michigan underground iron mines are increasing their working time. M. A. Hanna Company has stepped up its work week to six days in its five iron mines in the Iron River district. Pickands Mather & Co.'s operations on the Gogebic Range have been increased to a full four-day week of 16 shifts after working only 12 shifts for some time. These mines include the Sunday Lake at Wakefield, the Peterson at Bessemer, the Geneva and Newport at Ironwood, and Cary at Hurley. North Range Mining Company has reopened the Penokee mine at Ironwood which had been idle since last March.

Oliver Iron Mining Division of U.S. Steel Corporation is doubling the capacity of its crushing and screening plant at the Stephens open-pit mine near Aurora, Minnesota. A new truck dumping hopper, railroad car loading hopper, double-deck vibrating screen, and conveyor belt are being added. A stripping program is also underway there this winter to remove 1,700,000 yards of overburden.

Reserve Mining Company shipped 4,944,227 tons (vessel weight) of taconite concentrate pellets from its loading dock at Silver Bay, Minnesota during the 1958 season. In 1957, this figure was 5,069,960 tons (vessel weight). At the beginning of the 1958 season, 2,024,947 tons of pellets were stockpiled at the port. When the season closed, only 66,717 tons remained in the stockpile.

What is described as the world's largest slope conveyor belt, constructed by U.S. Rubber Company, is being installed at the Cleveland-Cliffs Iron Company's mines in Ishpeming, Michigan. The belt will have a center distance of 3,971 feet, and a total continuous belting length of over 7,500 feet. In operation it will carry 700 tons of low-grade iron ore per hour, traveling at a speed of 460 feet per minute, with the ore being carried from the 12th to 9th levels of the mine, or an elevation of about 800 feet.

The Mauthe Mining Company has resumed production from its two iron ore mines, the Newport and the Geneva, on the Gogebic Range near Ironwood, Michigan.

In spite of reduced production tonnage, the Cuyuna Range of Minnesota has been modernized by the use of 1,800-hp Diesel engines on the railroad haulage of ore to Superior, Wisconsin. The railroad, operated jointly by the Northern Pacific and Soo Line railroads, services all mining companies on the Cuyuna, including M. A. Hanna, Pickands Mather & Co., Pacific Isle Mining Company, and Rhude and Fryberger. During 1957, The Northern Pacific placed 200 new cars into service, each of which was of 70-ton capacity and utilized roller bearings.

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GETMAN BROTHERS

SOUTH HAVEN
MICHIGAN

Southwest Miners Meet In Carlsbad, New Mexico

Principal speakers at the Joint Convention of New Mexico Mining Association and Southwest International Mining Association in Carlsbad, New Mexico were Dr. James F. Tracy, physicist with the University of California Radiation Laboratory at Livermore, California, and George W. Nilsson, a Los Angeles lawyer with extensive mining case experience.

Dr. Tracy described the work in Project Gnome, a planned nuclear explosion in salt beds 25 miles east of Carlsbad. It is part of a study of nuclear explosives as a source of peacetime power, and has possible application in mining, excavating, and similar fields. There will be no fallout and no radioactivity as a result of the Gnome blast, according to Dr. Tracy. The charge will be 1,200 feet below the surface and will be 10 kilotons in magnitude; equivalent amounts of energy would be produced by burning 30,000 gallons of oil or by the output of a large electric generating station during a nine-hour period.

Mr. Nilsson's subject was "Road Blocks to Prospecting." Among his road blocks to the development of mining, he listed the Reciprocal Trade Act and the General Agreement on Tariffs and Trade. Under these, he said, huge amounts of imported minerals have come into the United States, causing shutdowns of many mines. He also spoke strongly against the Wilderness Bill now before the Senate which would withdraw large areas from prospecting and mining. He criticized the Department of the Interior for its action in mining claim matters, saying that the department did not conform to legal procedures.

Governor E. L. Mechem welcomed the mining delegates at a luncheon. New president elected for the New Mexico Mining Association at the convention is T. O. Evans who is in charge of uranium mining operations for the Santa Fe Railroad's mining subsidiary, Haystack Mountain Development Company.

ARIZONA

The Rare Metals Corporation of America, Tuba City, Arizona, is treating an average of 300 tons per day of ore said to assay about 0.27 percent U₃O₈. More than half of the current mill feed comes from independent producers in the Monument Valley region, from the Cameron district, and from the Grand Canyon. The company's own operations are in the Cameron area.

C. F. Weeks of Kingman, Arizona is shipping around 80 tons per day from his *White Spar* silica property in the Walapai district of Mohave County. The material goes to the mill of Consolidated Feldspar Division, International Minerals and Chemical Corporation, at Kingman.

C. D. Wilson of Sahuarita, Arizona, is mining a silica copper ore from the *Naragansett* mine in the Helvetia district of Pima County. Production is coming from a deep open-cut at the top of a hill where open-pit mining methods can be used. The ore is trucked to Sahuarita for rail shipment to Asarco's Hayden smelter.

The Lewisohn Copper Corporation, of Tucson, Arizona, is employing a crew of 8 to 10 men in underground stoping operations at its *King in Exile* mine in the Helvetia district. The ore is shipped to the Asarco smelter at Hayden, Arizona. Richard E. Chilson, president and manager, is directing the work.

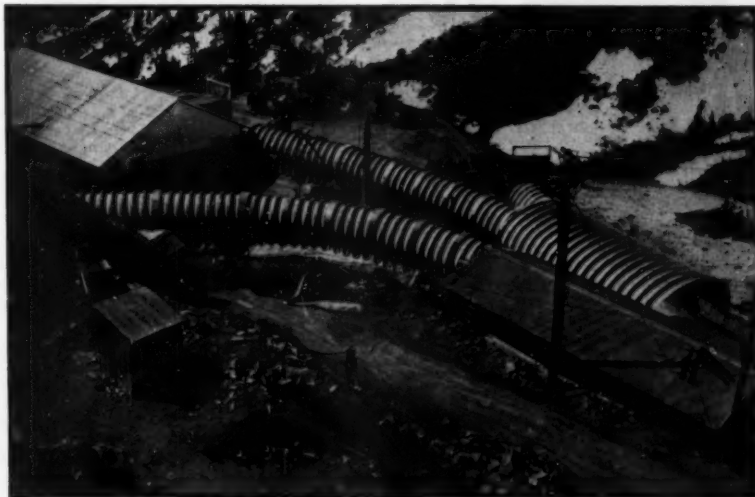
Operations have resumed at the *Harqua-Hala* gold properties nine miles south of Salome, Arizona, according to an announcement by Joseph Rego, general manager and board chairman of *Rainbow Minerals, Inc.*, an Arizona corporation recently organized to operate the property. The gold deposit was discovered in 1888 and was operated until the early 1930s when it became tied up in litigation. Numerous suits have recently been resolved and the way cleared for mining. Mr. Rego said the property includes the *Bonanza* mine, which yielded \$7,000,000 in gold at present values, and other well-remembered names like the *Golden Eagle*, *Queen of Fortune*, *Big Al*, *New Yorker*, and *Jack Pot*. A large tonnage of gold ore is reported in sight and additional tonnage is expected to be developed. There also are 290,000 tons of tailing that may be profitably treated with modern extraction methods.

Jaquays Mining Corporation, operating in the Globe area of Arizona, reports excellent results from the development program it is carrying out on its ore body.

Development faces are still being continued and all in good ore. Approximately six years of asbestos reserves have been established at the present rate of production of 600 tons of fiber per year. Bulk of the ore is soft, long, white, iron free fiber. The firm is moving operations to a new site, two miles east of the city, along Highway 70. Operations at the present location will be continued until the new plant is ready. Part of the ground work and building of a railroad grade have been completed and work on an 80 by 160-foot warehouse and fiberizing plant will start before the end of the year. The fiberizing section will have a capacity of about 10 tons of fiberized asbestos a day. Plans call for installation of a cruding section, probably next summer, which will have approximately the same capacity of the present plant, two tons of ore an hour.

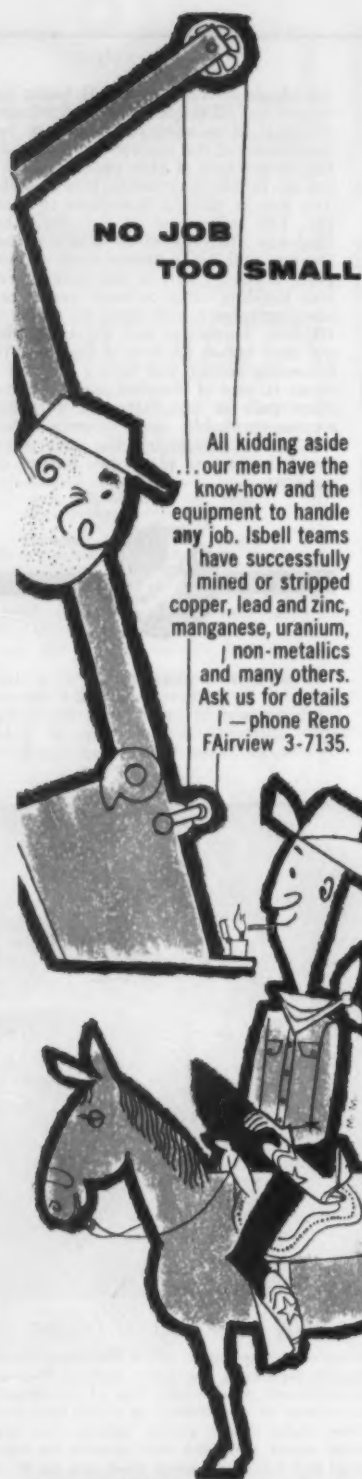


A six-man exploratory crew is now searching the Mojave Desert of California for boron and other minerals for *Sunray Mid-Continent Oil Company* of Tulsa, Oklahoma. Such minerals as beryllium,



Pre-Fab Steel Snow Sheds Aid California Mine

To prevent falling and blowing snow from hindering winter operations at the Pine Creek mine northwest of Bishop, California in the Sierra Nevada Mountains, the Union Carbide Nuclear Company has installed a unique system of pre-engineered snow sheds. One of the largest tungsten producers in the world, Pine Creek mine, located at an elevation of 9,350 feet, also produces copper and molybdenum. There are three tracks (shown above) leading from the mine which are extremely vulnerable to heavy winter snows. One track runs between the mine portal and a car dumper; another between the portal and a timber framing shed; and the third handles cars carrying waste to the waste dump area. To reduce costly work stoppages during these periods, snow sheds were constructed from pre-engineered trussless steel buildings manufactured by the Wonder Building Corporation. The sheds were designed and installed by the R. J. Goulet Construction Company of Bishop. The unusual problem of adapting straight buildings to curved track was solved by erecting the buildings in segments, with gap openings covered by 18-gauge flat galvanized iron sheets. One end of the flat strip sheet was bolted at the base on one side, and the free end passed over the roof and anchored in the same manner on the other side. During the summer, when mining activity increases, portions of the sheds are removed to permit better operational access. The pre-engineered design of the structures makes it possible to effect these changes with a minimum of time and labor, simply by unbolting and removing the unwanted sections of the sheds.



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SOUTHWEST

kyanite, bastnaesite, monazite, and special types of clay are also of interest to the firm.

Some shipments of manganese ore are being made from the Ajo mine, 6 miles west of Cazadero, Sonoma County, California, by Don de Silva, current operator. The mine has been operated off and on since 1924. The mine was formerly an underground operation but is now being mined as an open pit. Overburden is stripped with a Caterpillar D-6 bulldozer; ore is loaded into a bin at the edge of the cut, and dropped 20 feet by chute to ore trucks. Shipments are to the Mojave Mining and Milling Company plant at Wickenburg, Arizona.

The old Mexican silver-lead mines east of Bishop, California are being reopened by new owners, White Mountain Lead Company. An access road is being built and a centrifugal pulverizer mill installed. This is to be completed by April and then full-scale operations will start. The property was first located in 1862. It was purchased last year by White Mountain Lead for \$500,000.

Manganese mining is continuing at the Tex Young mines on the east slope of Ericson Ridge above Lake Pillsbury in Lake County, California. An open cut with five benches has been developed over a vertical distance of about 250 feet. Ore shipments have been made from the property since 1955. Ore is hand sorted and crushed before being delivered to a concentrating mill in Soda Creek.

Queen Peak Mining Company, a recently formed company, is mining manganese in an open-pit mine north of Shelter Cove in Humboldt County, California. The principal ore body is about 50 feet from the surface. Three Caterpillar crawler tractors are used for stripping and mining; a Traxcavator loads ore into the trucks. Average ore content is about 50 percent manganese, and production is shipped to the government stockpile at Fort Worth, Texas. Carl Makela and Into Wirta are the firm's principal officers.

Columbia-Southern Chemical Corporation, a subsidiary of Pittsburgh Plate Glass Company has placed a new soda ash and sodium susquicarbonate plant in partial operation near Bartlett, California.

Engineers of the University of California at Berkeley, California are studying the economic feasibility of "mining" the ocean floor for mineral-bearing rocks. Called "nodules" the small, spherical, mineral deposits have been known for about 75 years. Nodules recovered in the South Pacific have been found to contain about 25 percent manganese, 15 percent iron, and lesser amounts of nickel, copper, and cobalt. In some areas, they are estimated to be worth \$1,500,000 per square mile. The Berkeley engineers are now seeking ways of separating the various metals found in the nodules. If this is found to be economically practical, methods of recovering the nodules from the ocean bottom will be considered next.

The United States Department of the Treasury has announced a new schedule of charges for melting, refining, manufacture of bars, depositing, and assaying of gold and silver at the mints. Coinage mints are located at San Francisco, California; Philadelphia, Pennsylvania; and Denver, Colorado. The new charges have been established to enable the mint to recover the actual cost of operation.



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Prospecting on the west side of the ridge has opened a cut on the *Big Hope* claims.



Ventures Limited of Toronto, Canada, principal stockholder in *Eureka Corporation* of Eureka, Nevada, has sold its holdings to *Northfield Mines Inc.* of New York. The latter has participated in some Canadian mining operations. Officers of Eureka have instituted legal proceedings to determine the company's rights in regard to the lease it holds on the *Richmond-Eureka Mining Company* property. Richmond-Eureka has threatened to take steps to forfeit the lease unless Eureka proceeds with further work in the Fad shaft area. Eureka considers this futile.

Gold Placers-Nevada is currently operating the old *Donald* placer mine at Manhattan, Nevada. The company holds 3,520 acres, only a small portion of which has ever been worked. The firm plans an immediate increase in operation using a connected bucket line dredge.

Bristol Silver Mines Company has encountered ore on the 1200 level and is undertaking immediate development. Stopping has reached a point about 35 feet above the level, and the strike appears to be a downward extension of an ore body opened up on the 1050-foot level. Ore is silver-copper with a low lead-zinc content. The property is located in the Pioche mining district of Nevada.

In the main mine of *White Caps Gold Mining Company* near Manhattan, Nevada, pumps are working to lower the water level from 800 level to deeper parts of the mine. Some 10,000 tons of antimony ore and 8,000 tons of antimony-gold ore reportedly have already been blocked out. The company believes there are good prospects in the lower parts of the mine because of the mine's past history. Back in 1926, before heavy water flows developed, rich ore was recorded at the 800- to 1,310-foot depths.

Leadville Canyon Mining Company of Goldfield, Nevada is presently building a 50-ton-per-day portable pilot plant to test a new metallurgical process developed by one of the owners and operators, J. S. Wisdom. The process decomposes base metals and complex ores by acid decomposition and thermal extraction. Mr. Wisdom is also owner of the *Grandview Mining and Milling Company* and president of *Tri-State Mining Corporation*.

Kent Mahler, a Pershing County, Nevada miner and prospector, has been told by the *U.S. Mineral Laboratory* in San Francisco that the three stones he found in Nevada recently are diamonds. The stones were found while exploring a blue mud "pipe" in Dixie Valley. Mr. Mahler has filed a claim on the area.

A \$75,000 fire destroyed the *Minerva Scheelite Mining Company's* mill in south Spring Valley about 45 miles from Ely, Nevada. All of the building and equipment were completely destroyed, but most of the camp, including the power house, was saved. Cause of the fire is undetermined. Robert Stopper reports that the mill will be rebuilt when the tungsten situation improves.

Edgemont Mining Company, which has been operating and exploring the old *Edgemont* gold mine in the Centennial district of Elko County, Nevada for the past three years, has now closed down all operations. Recent exploration failed to show any encouraging results.



Homestake-Sapin Partners, operating in the Ambrosia Lake uranium district of New Mexico, reports that it has now reached ore in its *Section 25* mine, and water is under control. In the *Section 23* mine, where the firm is developing two levels, the upper one is dry but the lower one is proving to be wet. Crews are now driving over 1,000 feet of development headings per month. Having learned from the *Section 32* mine, they are now stopping every 75 feet to cut a drill station from which to fan out holes for drainage and geological information.

Homestake-New Mexico Partners' Section 32 mine has reached about 5,000 tons monthly production and it is increasing. The water problem is no longer a factor. The ore averages 6.5 feet in thickness in stopes. The crew has achieved over 10 tons per man-shift. Stopping has shown that the ore occurs in a series of sinuous channels, rather than in a solid sheet as the original drill

hole interpretations indicated. Reserves are in the order of 350,000 tons.

Drilling by *Phillips Petroleum Company* on the *Phillips-United Western Farmout* has resulted in discovery of a ore body on the east half of Sec. 28, T. 14 N., R. 10 W., Ambrosia Lake, New Mexico. An additional 75,000 feet of drilling to delineate the ore body is underway. Operation of a new mica mine and mill north of Santa Fe, New Mexico has been started by a group which includes the *Klute Corporation* of Denver. The property consists of 17 claims and is in the Santa Fe National Park. The mica occurs in a pre-Cambrian formation of muscovite-granite-pegmatite. Klute Corporation has designed a special milling process to separate the mineral from the gangue. Principal owner of the property is reported to be George Therrell of Dallas, Texas.

Kermac Nuclear Fuels Corporation's new 3,630-ton-per-day uranium processing mill is now in operation near Grants, New Mexico. The mill will process ore from six mines owned or controlled by Kermac, as well as a limited amount of "custom" ore purchased from independent operators. Constructed at a cost of \$18,000,000, the mill operates on an acid leach, solvent extraction process.

United Perlite Corporation reports that its mill for grinding and screening raw perlite is nearing completion. Original capacity has already been doubled and so the mill will process about 400 tons daily when in operation. The firm is a subsidiary of *United Western Minerals Company*. The \$300,000 perlite mill is being built in Taos County, New Mexico.

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COLORADO

Harry Williamson is mining fluorspar at Jamestown, Colorado and selling it to Ozark-Mahoning Company. Also active in the area is General Chemical Company where Jim Pennington is superintendent. Shipping to General Chemical are the Johnson Brothers, John Overly, and E. C. Ralston, who are mining the Gladstone claim. The claim was recently sold to Mr. Ralston, John Keifer, and Albert McGowan by the former owners, Jim Warren, Max Burger, and son.

Because of the low metal prices, no lead-zinc ore concentrates were sold by Rico Argentine Mining Company during the past fiscal year ended June 30. This was the first time in 20 years, the firm had no income from nonferrous metal production. Only 958 dry tons of lead-zinc ore encountered in development work were mined and milled. The concentrates from this ore are stored awaiting a more favorable price. A total of 52,985 dry tons of pyrite was mined—52,668 tons from the Mountain Spring area and 317 tons from the Argentine area, both near Rico, Colorado. All of the pyrite (except for 708 tons) was crushed for use in the acid plant. The latter produced 46,646 tons 100 percent basis of commercial sulphuric acid. During the year, a larger plant was completed.

Guy Dart and Conrad Smith are working the White Raven lead and silver mine at Ward, Colorado. A mill has been set up to high-grade the ore. On Beaver Creek, south of Nederland, Colorado, George Cowdery and associates are mining and stockpiling tungsten ore.

UTAH

Shattuck Denn Company has completed sinking of its 830-foot Bardon shaft in Utah's Big Indian uranium district.



Uranium Firms Study Logging Techniques

Century Geophysical Corporation has recently sponsored a series of conferences for uranium operators on the application of logging to uranium exploration. One meeting was held at Riverton, Wyoming and another at Grants, New Mexico. This picture above shows a part of the group attending the Wyoming conference. Papers were presented on resistance, self potential, drift surveys, gamma rays, and other methods of logging. The application of gamma ray logs to the estimation of radioactive ore reserves by means of radiometric analysis was discussed in detail. This is a completely new field for the use of gamma ray logging. Century Geophysical, with headquarters in Grand Junction, Colorado, has logged over 15,000,000 feet of test holes drilled exclusively for uranium exploration in the past four years.

The company is developing a new mine on the Velvet claims leased from Kerr-McGee Oil Industries Inc., and Anderson Development Corporation to replace the Club Mesa operations near Uravan, Colorado which are shut down. Ore from the shaft will be shipped to Kermac Nuclear Fuels Corporation's plant at Shiprock, New Mexico. Shattuck Denn, a subsidiary of Shattuck Denn Mining Corporation, plans additional shafts in the area. (See MINING WORLD, December 1958, pages 37-39 for details of the remarkable progress made in sinking this shaft.)

Bear Creek Mining Company is currently drifting on the 1,050-foot level in its Burgin shaft project in the Tintic district of Utah. This area of the prospect has not been explored before. It is still too early to evaluate the findings.

Bonneville Ltd. at Wendover, Utah has been conducting experimental work on recovery of by-products from potash brine produced at the plant. The firm also will receive a royalty from the Utah Salt Company which plans to harvest, process, and sell salt from Bonneville's ponds. Utah is erecting a \$250,000 plant near where Bonneville recovers potash through a solar evaporation process.

One of the largest capacity shovels ever used in a Western copper mine is now in use at the Utah mine of Kennecott Copper Corporation's Utah Mining Division. Western Contracting Corporation of Sioux City, Iowa, low bidder on the stripping project, is using a 13-cubic-yard, 191-M Marion electric shovel on the upper West side of the mine to load 50-ton Euclid trucks. Large tonnages of waste must be removed from these upper levels, where there are no tracks or electrification for railroad haulage, in order to continue mining on the levels below. At the present operating rate, Utah Mining Division is mining 30,000,000 tons of ore annually, moving more than 60,000,000 tons of waste, including contract stripping. The ratio of waste to ore removal is 2.2, including contract stripping. Western Contracting has another shovel operating on the East side of the mine, too.

Standard Uranium Corporation values its newly located ore reserves in the Big Buck mine at more than \$20,000,000. Drilling has now blocked out about 608,000 tons and exploration and development are continuing. The Big Buck claims

adjoin the Mi Vida mine of Ute Exploration Company in the Big Indian district of Utah.

United Western Minerals Company continues its exploration program in Colorado, as well as its farmout program with Norbute Corporation. In cooperation with Golden Cycle Corporation, metallurgical data has been compiled for a joint AEC application for a 200-ton uranium processing mill. The Colorado School of Mines has been working with United Western on metallurgical and chemical research, and United Western has been in continuous contact with the AEC on the overall developments regarding the mill application.

Union Carbide Nuclear Company has closed down 14 uranium mines on the Polar Mesa in Utah for the winter months. The company has been doing this each winter for the past several years because of the difficulty and expenses of ore transportation. It is planned to reopen them in the spring and present contractor-operators will be given first opportunity to resume operation. Approximately 1,500 tons of uranium ore per month are produced by the group; ore is taken to the mill at Rifle for processing.

WYOMING

The new \$3,500,000 uranium mill of Fremont Minerals Inc. at Riverton, Wyoming has about reached capacity and first uranium concentrates are expected to be produced the first of this year. The mill will operate at its designed capacity of 500 tons until its new contract with the AEC for expansion to 724 tons is actually signed. Then minor modifications will be made to convert to the new rate. The mill will process custom ore from the Gas Hills, Copper Mountain, and Pryor Mountain areas. It is the first to use parallel acid and carbonate processing circuits.

A new field of high-grade uranium ore seems to be opening up some 30 miles southeast of Lander, Wyoming. According to Jim Wade, general manager of Fremont Uranium Corporation which opened the field, some ore has tested as high as 1.377 percent U_3O_8 . Minimum assays have indicated 0.40 percent. Fremont shipped 90 tons to the Western Nuclear Corporation mill at Jeffrey City. Western Nuclear has optioned five claims in the area from Fremont for \$5,000, and has a similar option pending on seven others. The contract calls for a 100-ton-per-day minimum shipments providing the mine produces it, and a 500-ton maximum. Stripping is already under way. Fremont retains a 10 percent overriding royalty. The firm also holds 320 acres of mica and gold-bearing property in Sublette County, and 3,480 acres of gold property in Lincoln County.

Western Nuclear Corporation at Rawlins, Wyoming expects to increase its working force by an additional 100 men. The company's mill at Jeffrey City was forced to make a cutback last fall when the AEC stipulated that capacity of 400 tons per day be enforced. Increased activity will result for the new allocation of 845 tons, necessitating the increased payroll.

INTERNATIONAL NEWS

Peruvian Lead-Zinc Mines Allocate Export Quotas

The Peruvian lead and zinc producers have formed a Committee which has determined an official lead and zinc export quota for every mine in production. This Peruvian Export Quota for the last quarter of 1958 was based on 37 percent of the mine output of lead during the 12 months from July 1957 to June 1958, and 53.5 percent of the zinc output during the same period. Quotas were allocated to all producers regardless of whether or not they had been regular shippers.

Strict control on all exports is being maintained and the producer must have had a Letter of Guarantee before getting an export license. All export licenses to countries other than the United States were stamped by the Committee prohibiting any re-exports to the United States. Exports over the quotas can be made if a guarantee is made that it will be used only in accordance with producers' future quotas.

The Committee will establish new quotas each quarter in line with the United States quota determination for the next succeeding quarter.

A total of 51 lead quotas and 28 zinc were set. Some of the larger quotas are outlined in the table. In setting these quotas the annual production base of 157,941 tons of lead and 130,533 tons of zinc were used.

Peru Lead-Zinc Export Quotas in Short Tons for 1958

Firm	Annual Production Rate	Annual Quota	Quarterly Quota
Lead Export Quota in Short Tons			
Cerro de Pasco	31,506	11,656	2,888
Cia Minera Atacocha	19,629	7,263	1,798
Mines de Huaron	11,221	4,152	1,028
Mauricio Hochschild	8,551	3,156	781
Minas de Cercapuquio	8,496	3,143	779
Minera Milpo	7,876	2,914	721
Banco Minero	6,638	2,456	614
Minero Rio Pailanga	6,675	2,470	611
Minero El Brocal	5,274	1,951	484
Volcan Mines	4,153	1,537	384
Northern Peru	3,736	1,382	345
Zinc Export Quota in Short Tons			
Cerro de Pasco	39,830	21,309	5,327
Northern Peru	12,101	6,474	1,618
Volcan Mines	10,566	5,653	1,413
Minera Atacocha	9,270	4,595	1,240
Mines de Huaron	7,412	3,965	991
Minero Rio Pailanga	7,137	3,818	955
Mineral Milpo	6,316	3,379	845
Minera El Brocal	6,206	3,320	830
Banco Minero	4,453	2,382	596

Chilean Copper and Iron Attract Japanese Firms

Japanese mining interests are investigating copper and iron deposits in Chile.

In Antofagasta Province, the Nippon Mining Company has bought and is operating the Portezuela mine. This is an oxide copper deposit 15 kilometers south-east of the city of Antofagasta. The company is also negotiating for another property near the railway terminal of Baquedano which is about 75 kilometers north-east of Antofagasta. Japanese geologists have examined other copper deposits in and around the large El Abra copper deposit north of Chuquibambilla, and at the same time, they are also carrying on an extensive iron property examination from

the area round Vallinar north to Antofagasta. Mr. Namuri is Nippon's Chilean manager with headquarters in Santiago.

Mitsubishi Mining Company is also interested in iron, this time in the province of Atacama. Here the firm is developing the Las Adrianitas iron ore deposit near Copiapo, which is estimated to have a reserve of 12,000,000 tons. A new company is to be set up by Mitsubishi and several other Japanese companies to operate the deposit. Some \$25,000,000 will be spent to build facilities, including a mechanized port in Calderilla in order to ship the ore to Japan.

Interest is also being shown in an iron ore deposit called Las Pintadas located 20 kilometers from Copiapo. The Japanese reportedly plan to install a plant here to handle 1,000 tons daily.



UNION OF SOUTH AFRICA—New Witwatersrand Gold Exploration Company Ltd. has entered into a new prospecting agreement with Johannesburg Consolidated Investment Company and Anglo Transvaal Consolidated Investment Company whereby the two companies have a right to explore the Doornkop Area in the Roodepoort district at their

expense for a period of seven years, subject to termination on 30 days' notice. The New Wit company retains subscription and other rights. The new agreement covers both the upper and lower reefs, and follows the disclosure of disappointing results on the upper reefs in exploration under the previous agreement. The Johannesburg Consolidated firm has steadily increased its holdings in this general area over the last few years.

MOZAMBIQUE—Beryl and columbite continue to attract attention in Mozambique, although the pegmatite staking rush appears to be slackening. The country's leading producers reported this output for the third quarter of last year: *Empresa Mineira do Alto Ligonha*—beryl 92,391 kilos, columbite 2,878 kilos, bismuth 241 kilos, monazite 17 kilos, mica 263 kilos, gem Tourmaline 200 grams, gold 4,090 grams; *Sociedade Mineira da Zambesia*—beryl 47,500 kilos, columbite 3,734 kilos; *Sociedade Mineira de Morropino*—beryl 25,500 kilos, Columbite 33,000 kilos, lepidolite 2,000 kilos; *Joao da Costa Pinheiro*—beryl 3,000 kilos, columbite 300 kilos. No production was reported at *Sociedade Mineraria de Mocubela's* operations, and no report was available for *Sociedade Mineira de Mocumine*.

FRENCH EQUATORIAL AFRICA—Pacific Tin Consolidated Corporation's exploration project for diamonds carried out jointly with the *Natoma Company* has been terminated. Work indicated that where there were areas of alluvial ground



Chingola Stripping Exposes Folded Marker Bed

Overburden stripping at the new Chingola open pit copper mine of Nchanga Consolidated Copper Mines Limited in Northern Rhodesia has exposed the overturned fold shown in the picture above. The light colored bed is used as a marker bed in the sedimentary mine series in which Copperbelt ore is found. This is the pink quartzite which is always found 50 to 100 feet above the lower banded shale in which Nchanga's open pit ore is localized. Sometimes this pink marked bed is mineralized, but in the new pit only a small area was mineralized with malachite. The lower banded shale ore horizon actually was found two places in the pit due to folding. The upper fold was cut by the 5107 bench and was not mineralized. However, the more extensive lower limb on the 4900 bench (now the pit bottom) is extensively mineralized with malachite, azurite, chalcocite, and cuprite. Chingola, the newer and smaller of Nchanga's pits, is 1,000 by 1,000 feet in area and was 195 feet deep on August 1. From April 1957 to August 5,867,000 tons of waste were stripped, and from April 1958 93,236 tons of ore were mined. Eventually, Chingola will be 2,600 feet long, 1,500 feet wide, and 280 feet deep.

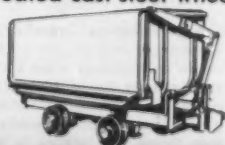
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About 1200 Card Granby-type cars are now in service in Anaconda's Montana operations. The latest designs differ in minor aspects from the original order, but all have proved highly satisfactory. The 115 cu. ft. car on 36" gauge has a high capacity to length ratio, keeping trains short. For maximum capacity, doors and back are internally braced. To ease loading shocks, the trucks are coil spring mounted, and the use of Card heat treated cast steel wheels with Timken bearings assure extended



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INTERNATIONAL

large enough to support dredging operations, the distribution of the gravels was too limited and the diamond values in the gravels too spotty to justify dredge mining.

UNION OF SOUTH AFRICA—*Barberton Chrysotile Asbestos Ltd.* reports its new adit has holed through to the No. 2 Level. In being advanced, the adit intersected a previously unknown lode of high-grade, highly recoverable fibre, 870 feet from the adit entrance, with a corrected width of 60 feet. With the holing through completed, considerable savings through the elimination of mechanical ventilation have been effected. A prospect winze from No. 2 Level has located payable fibre 105 feet below the Level with the dip constant at 50 degrees.

GHANA—Discovery of manganese deposits in the Dicove area of Ghana has been reported, but the deposits do not appear to be extensive.

UNION OF SOUTH AFRICA—*Venterspost Gold Mining Company* is sinking a tertiary incline shaft in the No. 2 shaft area to extend Main Reef development and insure adequate replacement of ore reserves from ore in ground beyond the operational limits of the existing shaft system in the area. In the southern section where operations are served by the No. 3 Subvertical Shaft, Main Reef values remain encouraging; a crosscut to the Ventersdorp Contact Reef has disclosed payable values but the extent of this is not yet known. Also in the southern section, a drive from the *Libanon* mine has yielded satisfactory Main Reef values and some payable Ventersdorp Contact Reef values over a limited footage.

GHANA—Exceptionally high values have been reported by *Ariston Gold Mines (1929) Ltd.* in reef development on the 23rd level of the North orebody. Work there exposed 14.5 dwt over a width of 119 inches, equal to 1,725 in.-dwt. A crosscut on the 25th level gave the equivalent of only 221 in.-dwt. and this exposure is thought, therefore, to indicate the southern limit of the orebody.

NIGERIA—*Naraguta Karama Areas Ltd.* has not yet decided about development of the 150,000-ton pegmatite deposit it located at Wamba. On the basis of assayed drill samples, this would give 400 tons of cassiterite, but under the existing price structure this yield would be uneconomical.

MOZAMBIQUE—The *Alto Ligonha* pegmatite field may turn out to be the biggest pegmatite field in the world. Two companies, *Sociedade Mineira do Melela* and *Monteminas*, have now prospected 60 square kilometers out of the 3,000-square-mile concession area, and have found 40 mineralized pegmatites with good showings of columbite and beryl. Most of these are smaller deposits producing about 10 tons a month; the operations break even at three tons of beryl monthly. To be commercially successful, it is necessary to work a large number of these smaller deposits at low cost, and to mechanize the large ones.

GHANA—*Ghana Main Reefs Ltd.* is sinking its main shaft to the 22nd level in order to test the downward extension of gold values exposed on the 19th and 20th levels of the central Bondaye section. Development results on the Ekotokoro and Tuappim sections are being maintained.

LIBERIA—Shares in a new subsidiary of the *Liberia Mining Company* are being

offered to the public for the first time by the Liberian government. The government holds 50 percent of the new company, and the Liberia Mining Company holds 15 percent. The new subsidiary will operate iron deposits in Capemount near the border with Sierra Leone.

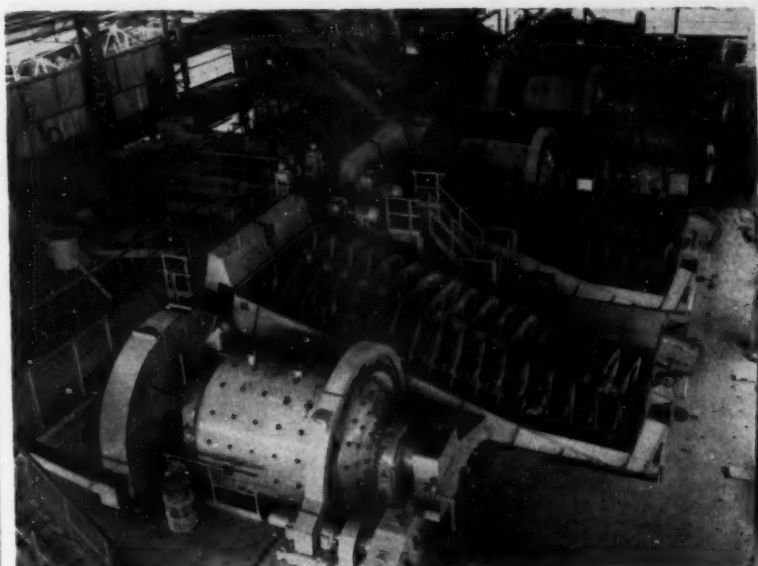
UNION OF SOUTH AFRICA—*Barberton Chrysotile Asbestos Ltd.* has experienced a falling-off in demand for chrysotile asbestos, largely through currency restrictions in France and South America and barter agreements between various European governments and Soviet Russia. However, the company has sufficient orders available to cover normal mining expenditure and completion of the new adit. The company has deferred the installation of the new treatment plant equipment but will erect the relevant buildings for the stockpiling of surplus fiber production. In the new adit, the fiber zone was entered at 870 from the portal and was still in payable ore at 950 feet averaging about 4 percent fiber up to 1½ inches in length. The ore body strikes diagonally across the adit. The total distance to hole is 1,200 feet. However, apart from continuing the adit, no further development has been advanced in the fiber zone.

FEDERATION OF RHODESIA & NYASALAND—*Bancroft Mines Ltd.* is expected to resume production from its copper mines in about mid-1959 at an anticipated rate of 40,000 tons of copper per year. Production was temporarily suspended last March when the *Anglo American Corporation of South Africa*, parent company, decided to cut production in order to reduce the total copper output of the group's copper mines by 10 percent.

SOUTH WEST AFRICA—*Consolidated Diamond Mines of South West Africa* has won its appeal against the dismissal of its application for a declaration of mineral rights between the high and low water marks of a 230-mile-long coastal strip. Prospecting rights to this strip had been issued by the South West African government early in 1957 to *Suidwes Afrika Perspekteerders Ltd.* The High Court at Windhoek had dismissed Consolidated's application for this strip, but the Appellate Division of the Supreme Court at Bloemfontein has upheld the firm's exclusive rights over the area.

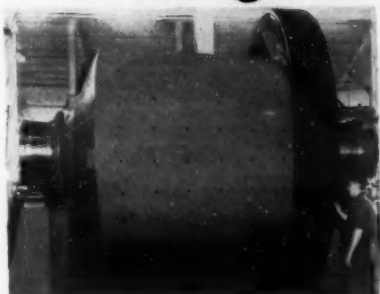
UNION OF SOUTH AFRICA—A new investment company has been incorporated in South Africa—*American-South African Investment Company Ltd.* It will invest over 50 percent of its assets in gold mining companies in South Africa, a number of the firms being those who also produce uranium as a by-product. Among the 21 issues being purchased by the new firm are: *Free State Gold Mines Ltd.*, *President Brand Gold Mine Company Ltd.*, *Welkom Gold Mining Company, Ltd.*, *Buffelsfontein Gold Mining Company Ltd.*, *Hartebeestfontein Gold Mining Company Ltd.*, *Blyvooruitzicht Gold Mining Company Ltd.*, and *Doornfontein Gold Mining Company Ltd.*

TANGANYIKA—Mineral exports from the territory during the first half of 1958 and 1957, respectively, were as follows: diamonds—245,477 carats and 145,439 carats; gold—27,280 ounces and 26,823 ounces; lead concentrates—7,000 metric tons and 5,125 metric tons; mica sheet—20,831 tons and 33,351 tons; vermiculite—38,771 tons and nil in 1957.



Shown here are four Hardinge 9-3-6-8 Tricone Mills grinding sulfide copper ores and mixed ores in a concentrating plant in the Belgian Congo, Africa.

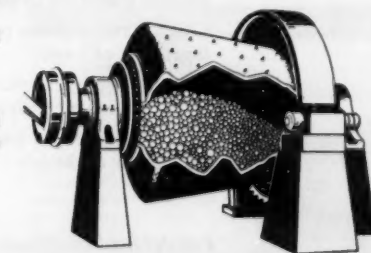
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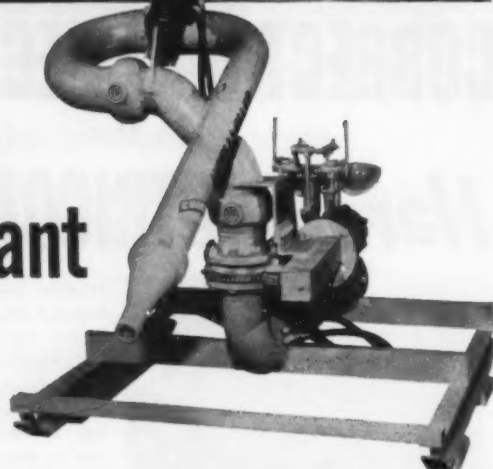
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INTERNATIONAL

FRENCH WEST AFRICA—*Miferna* (*Societe de Fer de Mauritanie*) is reported to be planning to begin production of iron ore from its property near Fort Gouraud in 1962. A rail link with Port Etienne just south of the Spanish colony of Rio de Oro will be completed in 1959, according to latest reports. There had been some discussion with the Spanish government about constructing a railway through the Spanish territory to the coastal town of Villa Cisneros, but apparently this has not been granted by the Spanish authorities. An annual export of 6,000,000 tons of iron ore is planned. Tazadit, 30 kilometers from Fort Gouraud, will be the townsite for the mining community.

UNION OF SOUTH AFRICA—Field work and other operations of the *Minerals Development Division* of the *Department of Mines* have been terminated for economy reasons. In the past, this division provided assistance to small mines. From now on, the identification and mineralogical investigation of minerals, ores, and rocks will be undertaken by the *Geological Survey Division* of the *Department of Mines*. Chemical analysis and the assaying of rocks and minerals will be undertaken by the *Division of Chemical Services* of the *Department of Agriculture*.

GHANA—*Bremang Gold Dredging Company* has been granted a loan of £150,000 by the Ghana government pending the government's plans for subsidizing marginal mines. In extending this loan, the government has taken into account the heavy capital cost to Bremang of moving the No. 3 dredge which is now proceeding on a new course as planned. The loan is interest free for two years; after 1960, it is repayable 2% percent to 1965 which is the repayment date.

BECHUANALAND—*Marble Lime and Associated Industries Ltd.*, through a wholly owned subsidiary, has secured a 20-year Crown Grant over the 9,000 square miles of Bangwaketse area for the development of the bauxite deposits sources. Exploration, which has yielded encouraging results, continues; mining is now in progress.

TANGANYIKA—*Geita Gold Mining Company Ltd.* has changed its mind about placing its mine on a care and maintenance basis; instead, the mine will be kept in operation at a lower throughput of 18,000 tons of ore monthly. Metallurgical problems which had been attributed to the fact that the ore from the newer sections of the mine was refractory were found instead to be caused by oxygen starvation in the agitators. This has now been rectified and, with the adoption of a finer grind, gold recovery can be maintained at about 90 percent. *New Consolidated Goldfields Ltd.*, which had been acting as technical manager, has resigned.



NORTH AMERICA

BRITISH COLUMBIA—*Violamac Mines Ltd.* has entered into an agreement with *Silver Ridge Mining Company Ltd.* to explore and develop the latter's

Wonderful mine at Sandon for 60 percent of the profits. The property, on which a new strike of high-grade silver-lead ore was made a few months ago, is adjacent to Violamac's Victor mine. Viola Mac-Millan of Toronto, heads Violamac.

QUEBEC—Great Whale Iron Mines has completed its \$500,000 examination of iron deposits near Hudson Bay. The work outlined large tonnages of open-pit ore suitable for beneficiation, and indicated that the area is favorable for establishment of large-scale production. The Iron Mountain deposit is said to have a potential of 600,000,000 tons of 38 percent iron. A harbor site has been surveyed. Next season 20,000 feet of drilling is planned, with most of the work concentrated on the "D" anomaly.

NORTHWEST TERRITORIES—Consolidated Discovery Yellowknife Mines Ltd. has completed shaft sinking with establishment of four new levels between 2,750 and 3,350 feet. Drilling on the 1,700-foot level gave indications of a gold-bearing vein structure lying 550 feet south of the present mine working so crosscutting is proceeding to check these drill intersections.

ONTARIO—Norway Lake Iron Mines reports an iron ore discovery on its 59-claim property about 25 miles northeast of Steep Rock Iron Mines. The ore is described as a coarse-grained, concentrating type magnetite averaging about 42 percent iron. Preliminary tests indicate a 69 percent concentrate at 100 mesh grind. Drilling is planned for this winter on two anomalies indicated by surveying.

QUEBEC—St. Lawrence River Mines is planning an open-pit operation on its extensive columbite deposits in the Oka area. A 500-ton-per-day mill would be built at a cost of \$2,500,000. Output is planned for mid-1961. The company controls about 47,000,000 tons of 0.4 to 0.5 percent columbite pentoxide, and about 6,000,000 tons of this is said to assay better than 0.7 percent. Some consideration has been given to arranging a developing-marketing agreement with a U.S. firm.

ONTARIO—The Prospectors and Developers Association will hold its 27th Annual Meeting and Convention at the Royal York Hotel in Toronto from March 1 to March 4, 1959. For the second year, the Geological Association of Canada and the Mineralogical Association of Canada will meet with the group. Technical sessions program is under the direction of Dr. Walter M. Tovell.

BRITISH COLUMBIA—Phoenix Copper Company Ltd. has been a small crew removing waste rock from near-surface ore bodies remaining at the old Phoenix mine near Greenwood. This is in preparation for a return to production in the spring if the strong market for copper continues. Granby Consolidated Mining, Smelting, and Power Company Ltd. is the parent firm.

SASKATCHEWAN—Potash Company of America Ltd. has brought its first ore to the surface from 3,333 feet underground at its \$20,000,000 Patience Lake project 17 miles east of Saskatoon. Potential annual production is 600,000 tons of ore. Exploration so far has uncovered a belt of potash 300 miles long.

BRITISH COLUMBIA—Blue Star Mining Company Ltd. is enlarging the old Matheson Tunnel in eastern British Columbia and plans to drift several hundred feet to get under the Wellington



Helicopters Increasingly Useful in Exploration

The use of helicopters in exploration and mining operations is gaining steadily as they prove themselves increasingly effective in speeding supplies to geological field parties; transporting crews to remote spots for field investigation; and moving personnel between key points. The U.S. Geological Survey has had great success with them in Alaskan mapping projects. This picture above shows that Australia, too, is making use of their special advantages. Here an Ansett-ANA helicopter is dropping supplies to a geological field party in southwestern Tasmania. Rio Tinto has been active in the area, and, most recently, Mount Lyell Mining and Railway Company Ltd. has joined with The Electrolytic Zinc Company of Australasia Ltd. in exploring this section. Field surveys were carried out from 31 major campsites during the past year, with transport of field personnel and supplies achieved mainly by helicopter and motor launch.

ore shoot. The property has been idle for 50 years. E. L. Borup is manager.

NORTHWEST TERRITORIES—Recent additions to the treatment plant of Giant Yellowknife Gold Mines Ltd. will bring the mill's capacity to 1,000 tons daily by next spring. Current rate is 760 tons. The new additions include a roaster unit and baghouse. While the baghouse is primarily to handle the arsenic problem, it will also enable the company to collect gold-bearing dust which had previously been lost in the roasting process.

BRITISH COLUMBIA—Caledonia Mines Ltd. has been organized by C. Lind of Kaslo to operate the old Caledonia mine near Kaslo. The agreement with the owner, G. E. McCready, calls for driving a new low level adit about 550 feet.

QUEBEC—Barvue Mines Ltd. and Golden Manitou Mines Ltd. will be amalgamated and a new company formed called Manitou Consolidated Mines Ltd. The action was taken because each of the firms was facing bankruptcy. A compromise plan has been agreed upon which would permit Golden Manitou to continue its mine operations and would maintain Barvue's assets substantially intact so that mining operations could be resumed there when the price of zinc justifies.

ALASKA—Ed Toussaint plans to go into production at his gold lode property in the Chandalar area 200 miles north of Fairbanks, next spring. A Fahrwald mill is now on the property and he expects to mill up to 20 tons daily.

QUEBEC—Chromium Mining & Smelting Corporation Ltd. has acquired a long-term lease on the Beauharnois smelter of Electro Reagents (Quebec) Ltd., wholly owned subsidiary of Dominion Magnesium Ltd. The plant has been managed and operated by a Chromium subsidiary, Atlantic Metallurgical Corporation, for the past six years. The company plans to increase production facilities at Beauharnois, and to close its plant at Sault Ste. Marie.

ONTARIO—Aeromagnetic Surveys Ltd. of Toronto has changed its name to Hunting Airborne Geophysics Ltd. It is a subsidiary of Hunting Associated Ltd.

ALASKA—A working model dredge has been donated to the University of Alaska School of Mines by the New York-Alaska Gold Dredging Corporation of Nyac, Alaska. The dredge has been set up in the ore dressing laboratory at the University and will eventually be placed in a pond near the school for actual operation. The corporation is the oldest active dredging company in Alaska. It is currently operating three dredges with power supplied by the company's own hydroelectric plant.

BRITISH COLUMBIA—Giant Mascot Mines expects to double its barite output from its operation at Spillimacheen. The concentrator has been producing about 50 tons of refined barite daily. The barite is shipped to the MacPhail Engineering Company at Tacoma, Washington for drying, sizing, and bagging of the product for market.

BRITISH COLUMBIA—A vein of high-grade lead-silver ore has been uncovered by bulldozing of the Harris claims in the Slocan mining district by Silver Mountain Mines Ltd.

ALASKA—A track loader for sluicing is in use in the Solomon River area. Herk Edwards and Jack France are using it to strip overburden and to dig bedrock to a depth of four feet, as well as for transporting the material to the sluice box. They report they have been able to move about 425 yards of gravel in five hours and are well pleased with the equipment.



QUEENSLAND—Mount Isa Mines Ltd. continues its plans for mining and smelting expansion at Mt. Isa, and increases its activity of its subsidiaries elsewhere. Extensions to the copper refinery at Townsville are already planned, although production will not be started until the second half of this year. A Krupp rod mill is to be installed with 80 tons per shift capacity. Expenditure on the refinery then will be more than £4,000,000. At Mt. Isa, another 30-megawatt turbo-alternator will be installed to double present powerhouse production capacity. Cost of a new power station is estimated at £5,000,000. In the four-week period ended October 19, ore production exceeded 6,000 tons per day for

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the first time; this was 10,000 tons higher for the period than during the previous four weeks. During 1959, 8,000 tons per day output is expected to be achieved. Present rate of copper production is 40,000 tons per year, but will become 56,000 tons per year. Capacity for copper output will become more than 70,000 tons annually.

REPUBLIC OF THE PHILIPPINES—*Itogon-Suyoc Mines Inc.* expects to place its 300-ton mill at its *Suyoc* mine in operation by the end of the first quarter of this year. The mill has been designed to recover gold as well as copper.

TASMANIA—Official announcements regarding iron ore discoveries in the Savage River area put tonnage at "about 100,000,000 tons of low-grade ore." Diamond drilling has been undertaken by *Rio Tinto (Aust.) Pty. Ltd.* on behalf of the *Tasmanian Mines Department*. In recent years, similar discoveries have been made at Roper Bar, Northern Territory, and Constance Range, Queensland. It is too early for these deposits to have any economic significance.

NEW CALEDONIA—Mining activity is at a low ebb. *Le Nickel* is running its smelter at 50 percent capacity and is having technical difficulties in operating its new electric plant. Nickel metal produced by *Le Nickel* has been selling at 1,100 francs Metro per kilo, compared with Canadian nickel priced at 700 Francs Metro per kilo. The French government reportedly is now subsidizing *Le Nickel* so that its product will be competitive. Export of nickel ore to Japan has dropped considerably. 1957 exports totaled more than 1,000,000 tons of nickel ore at 3.0

percent Ni; 1958 exports were about 250,000 tons.

REPUBLIC OF THE PHILIPPINES—*Marinduque Iron Mines Agents, Inc.* is shipping to Japan high-grade copper ore which averages from 12 to 15 percent copper per ton from its *Bagacay* mine on Samar Island where a 600-ton concentrating plant is under construction. The company is making shipments to Japan from its *Sipalay* copper mine on Negros Island.

QUEENSLAND—An independent mining consultant recently estimated that *Mary Kathleen Uranium Ltd.* has ore reserves of 6,600,000 short tons averaging 0.143 percent uranium oxide. At the current 89 percent recovery rate, the ore should yield 8,400 short tons of oxide over a 14-year life on the basis of present milling operations. A contract for £A40,000,000 is held with the United Kingdom Atomic Energy Authority for the supply of 4,500 tons of uranium oxide. After allowing for repayment of the company's £A13,000,000 loan, it is estimated that the mine will make a total profit of approximately £A9,000,000. *Rio Tinto Company, Ltd.*, manages the operation.

NORTHERN TERRITORY—*Mount Harris Tin Mines N.L.* sank No. 1 prospecting shaft to 60 feet and commenced a second shaft 260 feet to the north. This show was favorably regarded by the *Bureau of Mineral Resources and Commonwealth Mining Investments Ltd.* had a 10 percent interest with a further 10 percent option. It has now been announced that operations are being suspended for further examination as

samples do not agree with preliminary figures before operations commenced.

REPUBLIC OF THE PHILIPPINES—*American Exploration & Mining Ltd.*, a wholly owned subsidiary of *Placer Development Ltd.*, has applied for a government lease on claims covering a large potential open-pit operation on Marinduque Island. Initial diamond drilling had indicated a considerable tonnage of low-grade copper. Exploration has been halted pending granting of the lease.

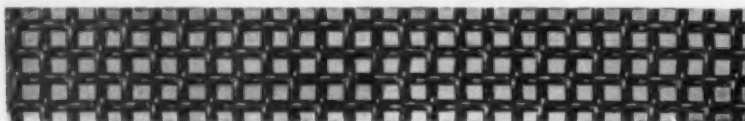
SOLOMON ISLANDS—About 8,000,000 tons of low-grade phosphate rock have been found on Bellena Island in the British Solomon Islands during a joint search by Australia and New Zealand in the southwest Pacific. A team will survey the central Pacific area next year. To date, examinations have been made of the Marshall-Bennett group and adjacent islands east of Papua; a number of small islands in the British Solomons; the St. Matthias Islands north of New Ireland; and several small islands of the Admiralty and Ninigo groups.

REPUBLIC OF THE PHILIPPINES—*Engineers for Manila Mining Company* estimate that over 4,000,000 tons of 1.17 percent copper have been blocked out on the copper section of the firm's Mindanao property. Diamond drilling will be continued to increase the ore reserve so that consideration can be given to building a mill. The firm also has a copper property in Masbate where development work during the past few months has been mainly on a copper vein on "Luck 5" claim. A search for other minerals on Mindanao has uncovered a gold deposit, also carrying some silver and copper.

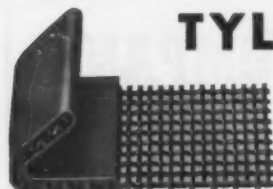
INDONESIA—The Indonesian government is rumored to be negotiating with Yugoslavia about exchange of tin, rubber, and coffee for machinery or services, such as help in building shipyards. Indonesia is also said to be looking into the possibility of increased use of Yugoslavia's Adriatic port of Rijeka as a transit point for shipments to Europe, instead of Amsterdam or Antwerp.

AUSTRALIA—Reaction of the *World Bank* to requests for funds for development of the Mount Isa-to-Townsville (Queensland) rail link is said to be unfavorable, despite a recent mission's interest in development projects associated with expansion of mining in the Mount Isa-Mary Kathleen area. A railroad of equal importance which has not received the publicity of the other venture, is a link between Port Pirie, South Australia, and Broken Hill, New South Wales. At present this is a 253-mile stretch of narrow gauge track. Conversion to standard gauge would cost about £13,500,000. Savings would accrue to Broken Hill silver-lead-zinc mines which transport lead concentrates to Port Pirie for smelting, and also to east-west traffic and vice versa which must now travel via Adelaide, South Australia, and Melbourne, Victoria. *Peko Mines* at Tenent Creek, Northern Territory, would benefit considerably in regard to shipments of copper concentrates from Alice Springs, Northern Territory, to Port Kembla, New South Wales.

REPUBLIC OF THE PHILIPPINES—*Samar Mining Company* at Sibuguey, Zamboanga, reports that it has blocked out 7,588,000 metric tons of ore so far in developing its iron ore property. Successful deep drilling indicates the total may exceed 20,000,000 tons. Present plans now call for an annual production



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of between 600,000 and 700,000 tons. In Davao where the firm is producing copper and gold from the Masara mine, it reports that, with integrated operations, mill tonnage can be raised to 400 tons per day.

NEW ZEALAND—Three rival groups are said to be interested in establishing a small steel mill based on remelted local scrap. It appears that this would be the forerunner of an attempt to establish an iron industry based on the black sands of the area. *Fletcher Holdings, Ltd.* which has been advised by *Kaiser Engineers of California*, favors a site in Auckland. *New Zealand Development Corporation* favors a site near Dunedin, South Island.

WESTERN AUSTRALIA—The Western Australia government has granted prospecting rights for diamonds in the Kimberley area (no relation to Kimberley, South Africa) to a Melbourne, Victoria company. *Whiteacres Estate Pty. Ltd.* The company plans to prospect in the Mount Hann area and also near Cairns (North Queensland). A company known as *Realty Mining Syndicate N.L.* has just been registered in Melbourne. Only £320 has so far been subscribed and *Whiteacres Pty. Ltd.* owns most of this.



EUROPE

UNITED KINGDOM—Tin production at *South Crofty Ltd.*'s operation in Corn-

wall is steadily being increased as sections of the new plant are put into operation. Most of the plant construction is now completed; the heavy media separation plant, washing plant, and rod mill are all in operation. As a result of these alterations, it is now possible to handle an increased tonnage from the mine. The company is seeking additional funds to finance further development, including sinking the *New Cooks Kitchen* shaft an additional 240 feet. It is reported that the No. 4 Lode appears likely to continue as an economic prospect for a considerable depth below the deepest horizon now being worked, while other lodes below the 2,040-foot level are likely to be important ore bodies. The company also holds mining rights in the Roskear Area which was formerly part of the Dolcoath mine in which there is considerable promise.

YUGOSLAVIA—The French firm of *Pechiney* is currently enlarging the aluminum plant at *Kidricevo* under terms of a recently signed agreement. Alumina production will be increased from the present 45,000 tons per year to over 90,000 tons, and aluminum production will be increased to 30,000 tons (in 1957 *Kidricevo* produced 14,961 tons). *Pechiney* will introduce a modified version of the Bayer process in place of the Fulda tower process. In 1958 the *Razine* plant near Sibenik, Dalmatia, went into operation. 70 cells were constructed at this new plant, capable of producing 3,000 tons of aluminum annually; half of the cells are now in operation.

PORTUGAL—Work done so far by *Beral Tin & Wolfram Ltd.* in its Vale

da Ermida section has established the existence of a large tonnage of ore containing more than three parts of tin to one part of wolframite. Overall grade of the deposit, though much lower than the average grade of wolframite ore in the main mine, is still remarkably consistent. During a six-month period from April until September 1958, the value of production from the Vale da Ermida section covered working costs. It is expected that when the *Panasqueria Mill* is equipped to treat the whole of production, profitable operations will be possible because working costs will be substantially reduced.

RUMANIA—Geologists are reported to have discovered rich iron ore deposits near the iron ore mining center of *Opnele de Fier*.

AUSTRIA—*Veitscher Magnesitwerke*, Austria's largest producer of magnesite, has founded a magnesite research center at *Goss* in the province of *Styria*.

SPAIN—In the old lead-zinc mining district of *Linares* in southern Spain, two promising veins have been found. The discovery was made when the dewatering and exploration tunnel, which forms part of the *Plan de Fomento de Jaen* (General Development Plan for the Province of Jaen), reached the lower part of the *Arrayanes* mine. It is expected that these two prospects will give new life to the *Linares* mining district.

NORWAY—*Rana Gruver A/S* has been conducting iron ore beneficiation tests in its new pilot plant at *Mo-i-Rana* in north central Norway. A new flotation method developed at the Norwegian University

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of Technology is being used. So far, the low-grade ore has been concentrated to 60 percent Fe, and there is every expectation that this will be brought up to 70 percent before the pilot plant is broken in. The Iron and Steel Works at Mo-Rana which Rana Gruver hopes to supply, requires 65 percent Fe for its operations. The ore used in the tests comes from the Oertmann deposits in the Dunderland Valley, once operated by the British firm, Dunderland Iron Ore Company. Diamond drilling has indicated about 70,000,000 tons of low grade ore. The nearby Oeffjell deposits are believed to contain about 200,000,000 tons.

SPAIN—The Spanish government has released its control on many of the possible uranium producing mines. In these mines, production is free but has to be sold to the government agencies. Minimum deliveries are in 20-ton lots. For deliveries of over 1,000 tons per year, a special contract with the Atomic Board is required. The price has been fixed at 400 Pesetas a kilo of up to 1 percent uranium ore, with a premium of 50 pesetas for higher units. The price fixing is for a period between November 1, 1958 and November 1, 1963. It is expected that a number of small operators will make a try at uranium mining which until now has been prohibited ground for the small private miner.

UNITED KINGDOM—Lowland Lead Company, associated with the Siamese Tin Syndicate, has been forced to close down its operations in the Leadhills-Wanlockhead area of southern Scotland, and the concentrating plant is being sold. It is also reported that exhaustion of ore reserves at the Greenside mine operated by the Basinghall Mining Syndicate Ltd. will

force it to close within a year. This mine is located near Glenridding in Cumberland. In recent months it has also been found impossible to continue operation of Laporte's Bridford barite mine at Christow, Devonshire. Production for the company's requirements will come from its mines in the north of England.

WEST GERMANY—A beautiful book has just been printed by Verlag Gluckauf, GmbH., Essen, West Germany which portrays the influence of the mining industry on the creative arts from the stone age to the present. The 480-page book has 62 pages in color, and 330 black and white illustrations. Price is 98 Deutch Marks. Even the celebrated Van Gogh painted two pictures based on the return home of the miners. This unique art-historical document shows how the creative and cultural achievements of the miners influenced the artisans of their times. The book is by Dr.-Ing. Heinrich Winkelmann, originator of the Mining Museum at Bochum, West Germany, in collaboration with Siegfried Lauffer, Christian Beutler, Walter Holzhausen, Erich Köllmann, Hanns-Ulrich Haedeke, and Eduard Trier.

EUROPE—The Iron and Steel Committee of the Organization for European Economic Cooperation estimates that the 17 countries belonging to the group will produce about 108,320,000 tons of crude steel and 82,250,000 tons of pig iron in 1961. This would mean a 30 percent increase for steel over the five-year period which started in 1956, and 35.6 percent increase for pig iron. The committee also forecasts a 30 percent increase in demand for lean iron ores (from 86,000,000 tons in 1956 to 111,750,000 tons in 1961),

and a 45 percent increase in demand for rich iron ores (from 44,400,000 tons to 64,000,000).

RUSSIA—A new method of geological prospecting, using short radio waves, has been reported by the Soviet Ministry of Geological Survey & Conservation of Minerals. The method, described as radio-screening of ore beds, operates on the theory that various ores will react differently to the waves, depending on their specific electric properties. Radio equipment designed by the USSR Prospecting Techniques Research Institute can be used for screening in drill holes at any depth. A transmitter and receiving set are lowered into two adjacent holes, from 200 to 300 meters apart, and can determine the outline and depth of ore bodies lying between the holes. Further research is underway to develop radar-type equipment for the same purpose, as well as a small television set which will enable the operator to "see" into the hole and study the ores directly.

UNITED KINGDOM—Continued efforts are being made by the Atomic Energy Division of the Geological Survey to find workable deposits of uranium ore in Cornwall and surrounding counties. Air surveys, initiated in the western and central areas of Cornwall, have been extended to the remainder of the county and will include Somerset and Devon. Exploratory drilling will be undertaken in favorable areas indicated by the survey. The most encouraging results to date have been found in the St. Austell area where drilling will soon begin. Several tin mines in the area will be investigated in view of using them for development bases rather than developing new underground headings.

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LATIN AMERICA

CHILE—Cia. Minera Brillador, located at La Serena, recently started operation of a 10-ton-per-day sulfuric acid plant which will permit increasing their operations to treat 100-tons-per-day of oxide copper ore. Part of their acid production is sold to the Mining Credit Bank for use in their own plants. This company is a completely integrated open-pit operation, with 2,000,000 tons of oxide copper ore in reserve, and an undetermined quantity of sulfide mineral. The production of Cia. Kinera Brillador at present is 30 percent in copper cement, and 70 percent in cathodes.

CUBA—The Cuban Independent Oil Company has organized the Cuban Magnesite Corporation to calcine magnesite from a large ore bed the company controls. A core drilling program has not been completed, but over 50,000,000 tons of this ore has been estimated so far.

MEXICO—La Dominica S.A. de C.V., a subsidiary of Dow Chemical Company, is reported to be planning to start construction early this year on a fluorspar reduction mill on the Coahuila side of the Rio Grande at Heath Crossing. Initial output is to be 100 tons per day of acid-grade concentrate from fluorspar mined from the La Dominica deposits about 25 southwest of the mill site. After milling, the concentrates will be hauled by truck

across the river to a shipping terminal which will be built about one mile east of Marathon in Brewster County, Texas. Marathon is about 70 miles northwest of the mill site.

BRAZIL—Kaiser Industries is considering investment in Brazil's steel and aluminum industries. A \$50,000 feasibility study has been made to determine whether to erect an integrated steel mill in Sao Paulo, and a geographical investigation of bauxite deposits is also being made. The steel mill under consideration would cost about \$80,000,000 and would have a capacity of 1,500,000 tons.

PERU—Cia. Minera Condor S.A. had planned to go into production at its Condor No. 2 mine in the fall of 1958, but difficulties in construction of a mile-long conveyor from the mine to the flotation plant, plus shortage of funds, delayed completion of all planned installations for several months.

BRITISH GUIANA—British Guiana Consolidated Goldfields Ltd. reportedly has decided to cease operations on the Konawaruk River because of rising costs, technical difficulties, and labor troubles. The dredge, which was shipped at great expense from New Guinea and flown dismantled from Georgetown to the interior, will be placed on a care and maintenance basis.

CUBA—In order to keep its new Moa Bay plant operating at capacity, the mine of Moa Bay Mining Company in Oriente Province will have to handle some 20,000 tons of ore and overlying material each operating day. For the most part, conventional scrapers will be used; actual mining will be done with draglines of up to five-yard capacity. Scraper operators will readily spot the upper limit of the ore body when their blades hit paper containers of lime, preplanted at the point where the ore begins to run about one percent nickel. The bottom "cut-off" of the limonite ore, 10 to 100 feet deeper, is usually indicated by a distinct color change. Serpentine-type ore which occurs below this point will not be treated by the acid leach process, but will be mined and stockpiled for possible future treatment by other processes.

ARGENTINA—Borax production in Salta Province has been increased considerably. A large purifying plant was established in the capital city, Salta City, and another is to be erected in Camp Quijano in the same province.

CHILE—The latest survey made by the joint Japanese-Chile venture in the Copiapo region indicates that there are about 20,000,000 tons of high quality iron ore located there. Mitsubishi Mining Company has been investigating the area since 1956. Under the present plan, the mines may yield between 300,000 and 350,000 tons of iron ore annually after 1959. This will go to Japanese steel mills, including Yawata Iron & Steel Company. Later, the capacity may be expanded to between 700,000 and 1,000,000 tons annually. Two ore carriers are to be constructed to transport the ore to Japan. About 3,600,000 yen will be required for the two vessels, and another 1,800,000 yen for the development of the mines.

PERU—Hewitt-Robins Inc. has received a \$700,000 order for design and construction of a conveyor system for the new ore pier being erected at San Juan by Cia. Explotadora de Hierro de Acari. The shipping terminal will serve the Acari iron ore property, owned by Pan-

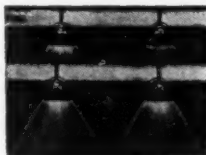
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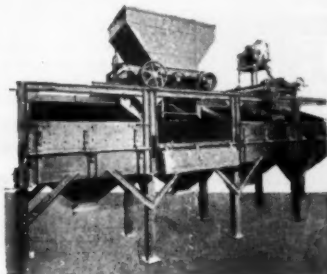
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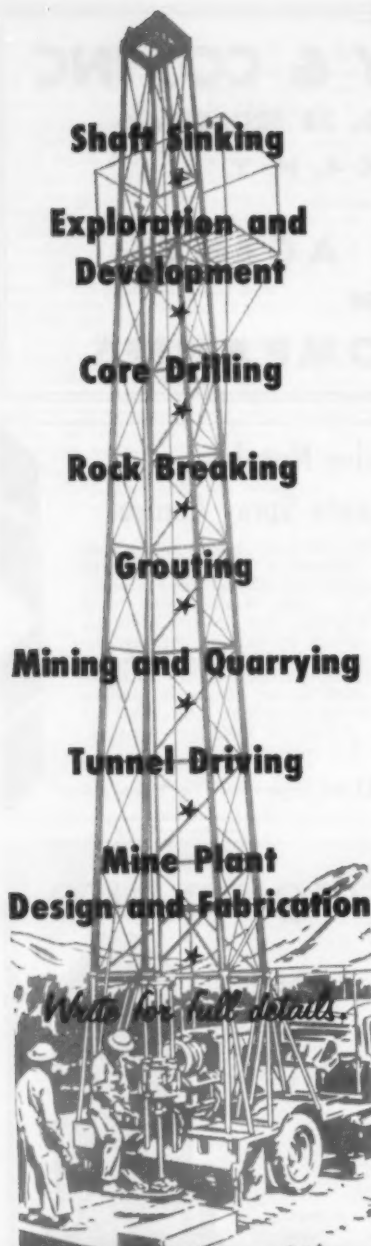
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INTERNATIONAL

american Commodities S.A., parent company of **Cia. Explotadora de Hierro de Acari**. First ore shipments are expected in the middle of 1959 at an initial rate of 1,000,000 tons per annum.

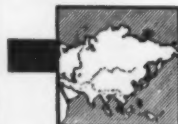
ARGENTINA—**Corporacion Nord-Patagonica** is starting prospecting of the **Sierra Grande** iron ore deposit in the Province of Rio Negro. Some 70,000,000 tons of iron ore are estimated in the deposit, and adjacent to the area there are also important manganese deposits.

MEXICO—**Minerales y Metales Industriales, S.A.** has changed its name to **Minerales Pennsalt, S.A.** The activities of the company will remain unchanged.

BOLIVIA—**Bol-Inca Mining Corporation** is continuing field investigation of its properties in Bolivia. Unexpected depth of formation has been encountered necessitating the use of heavier drilling equipment which is now in transit. **Natomas Company** of Sacramento, California has a controlling interest in the firm.

CHILE—**Andes Copper Mining Company** is spending \$103,000,000 in establishing facilities for mining and milling copper ore at **El Salvador** in the province of Atacama. Ore reserves are now estimated at 375,000,000 tons averaging 1.6 percent Cu. The main haulage way, the **Inca Adit**, has been completed. It is 14 feet 10 inches wide, and 17 feet high. During construction 400,000 metric tons of rock were removed. Work was speeded by the use of a "cuchufleta" or muck train, composed of four cargo railroad cars equipped with a scraper that removed rock from the mucking machine to the loading car by conveyor belt. The new mill is expected to treat 30,000 tons of ore daily, and annual copper output will be around 100,000 tons. The mining installations will be equipped with the most modern machinery. The new **Anaconda** subsidiary, **Anaconda-Jurden Associates Inc.**, is responsible for planning and construction of electrical plants, bridges, laboratories, roads, sewerage, water for civil and industrial purposes, etc.

CUBA—**Cia. Minera Buena Vista S.A.** has installed a new 350-ton-per-day concentrator at its copper mine near **Cabanas**. The plant is already running over capacity at 425 to 450 tons and is being enlarged to treat 500 to 550 tons. The ore is solid pyrite containing 7.0 percent copper as chalcopryrite. The mine is open pit, and known reserves presently are about 1,000,000 tons. After the copper is recovered from the ore as 30 to 32 percent copper concentrate, the pyrite tailing is to be sold for its sulphur content or burned locally and made into sulphuric acid. **William Rogers Wade**, consulting mining engineer of **Marysville, Montana**, designed the plant and supervised construction.



ASIA

MALAYA—**Rompin Mining Company** has been set up as a subsidiary of **Eastern Mining and Metals Company** to develop iron ore deposits in the **Pahang** jungle. Plans call for production to start in 1964 at an initial rate of 800,000 tons, increasing to 1,500,000 tons in the second year, and 2,000,000 tons in the third year of

operation. The \$50,000,000 investment is situated 110 miles up the **Rompin River**. The company has already spent about \$3,500,000 on intensive geological investigation over the past five years. Mining leases for a period of 21 years are held over a 3,000-acre area, together with another 2,000 acres for construction of a railway to the coast, and for other auxiliary buildings. Some 17,000,000 tons of high-grade ore averaging 62 percent iron have been located. The company also holds prospecting licenses and permits for another 30,000 acres and these will be explored later. At present **Eastern Mining and Metals** operates the **Bukit Besti** mine at **Dungun, Trengganu**.

CEYLON—An 8,000,000 Rupees ilmenite project is scheduled to get under way next month. The project will produce an estimated 60,000 tons of ilmenite annually when in full production, but in the first six months the Ministry of Industries expects to separate about 5,000 tons from the **Pulmoddai** beach sands. A pier is under construction for loading the ilmenite from the project site onto the ships. The operation is under the supervision of **C. Yamada**, a Japanese mining and rare earths expert, and a **Mr. Moorthy** who has worked on similar ventures in India.

JAPAN—**Nippon Mining Company** plans to increase its present capacity of 4,500 tons to about 6,500 tons. Smelting and refining equipment at the **Hitachi** copper mine seems adequate so the company plans only to enlarge the electrolytic equipment. For treatment of foreign ore, it is more profitable to use the **Saganoseki** smelter which is better located geograph-

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ically. Because of this, Nippon Mining is considering the advantages of switching Saganoseki Smelter to oxygen smelting entirely, and then constructing electrolytic cells.

INDIA—The government has formed the *National Mineral Development Corporation* to develop all minerals included in Schedule A of the Industrial Policy Resolution of April 1958, excluding oil, natural gas, and coal. Among its first duties will be to start development of the *Kiriburu* iron ore deposits in Orissa state. First shipments from these mines to Japan are scheduled to start in 1961 or 1962, with regular shipments by the end of 1963. The *Bailadila* iron ore mines, also in Orissa state, will be developed next. These require construction of a rail link which will not be possible until 1964.

BURMA—According to the recently published government economic survey, mineral production in Burma (other than petroleum) during 1957-1958 is expected to maintain the 1956-1957 level despite drastic drops in prices of certain minerals, such as tungsten, zinc, and lead. The decline in production of the smaller mines will be offset by increased production in the larger mines. The value of mineral exports for the first half of 1957-1958, however, showed a decline of 24 percent compared with the corresponding period of the previous year.

JAPAN—A large uranium vein extending over a distance of nine miles has been located in the Tottori-Shimane border area, three miles north of the uranium deposits at Ningyo Pass. The deposits measured 20 feet at their deepest point, according to the *Japan Atomic Fuel Corporation*. Unlike the Ningyo Pass deposits which are in sandstone layers, these deposits were found in conglomerate layers. Additional prospecting is continuing.

THAILAND—*Tromal Prospecting Ltd.* is still searching for tin off the coast of Siam. Financing comes from an associated group of companies in the *Tronoh-Malayan* group. No payable areas have been defined, but results continue to be encouraging. *Tronoh* also has an interest in *Aokam Tin Ltd.* which is dredging for tin off the island of Bhuket. Some difficulties are still being experienced with the grab dredge but progress is being made.

JAPAN—Mining of the *Daikoku* and *Benten* copper deposits has been started by *Nitto Metal Mining Company*. The *Daikoku* deposit has proved reserves of 1,000,000 metric tons containing 2.0 percent Cu, and the *Benten* has 500,000 metric tons averaging 2.4 percent Cu. Both are producing about 30 metric tons of crude ore daily. The ore goes to the *Ainai* mill for treatment, so the *Ainai* is being expanded to increase its monthly capacity from 4,000 tons to 7,000 tons. The copper and zinc concentrates will then go to the *Kosaka* smelter of *Dowa Mining Company*.

THAILAND—It has been rumored that an unnamed Japanese firm is interested in establishing a zinc products manufacturing plant in Bangkok. The firm is said to be willing to invest about \$750,000 in the enterprise to produce some 4,000 tons of zinc products monthly. The Thai government is anxious to encourage such plans.

MALAYA—The difficulty of continuing profitable operations on restricted production imposed by the *International Tin Agreement* is cited as the reason for *Hongkong Tin Ltd.* and *Kent (FMS) Tin Dredging Ltd.* placing their dredges on

a care and maintenance basis. Both companies are negotiating for a transfer of their respective tin quotas to other operating companies within their groups. In this way, they hope to make arrangements whereby the future cost of dredge and property maintenance would be met by compensation from sister companies.

BURMA—*Anglo Burma Tin Company (1956) Ltd.*, a joint venture company, reports that operations from all sections resulted in an output of 130.30 tons in the year ended June 30, 1958, as compared with 96.83 tons in the previous year. Output from the *Heinda* section by bulldozers and tribute operation accounted for 116.92 tons, compared with 75.27 tons a year ago. A higher production could have been achieved were it not for the constant bursting of pipelines and stoppage of bulldozer operations because of lack of spare parts. The firm may have to increase its capital in order to replace the pipelines and cope with rising costs of both material and labor.

KOREA—The *Ministry of Commerce and Industry* has established a long-term gold procurement program. Under the program, gold is to be purchased at an average monthly rate of 544 kilograms in 1959 from an estimated total production for the year of 7,000 kilograms. In 1960 and 1961, 835 kilograms will be purchased monthly from an annual production rate of 10,000 kilograms. Gold production will be increased to 10,835 in 1962, but the monthly average procurement will be maintained at 835. Monthly production this year has averaged only 200 kilograms as against 500 kilograms estimated under the program. Gold producers maintain that unless dras-

tic measures are adopted, increased gold production will be impossible. The *Mining Bureau* has urged the *Ministry of Finance* to act promptly upon the measures for encouraging gold production which were adopted by the *Monetary Board* recently. Included are government subsidies at the rate of 1 percent of the current gold procurement price.

PAKISTAN—Under a new ordinance, prospecting of certain categories for minerals without a license or a lease in the Province of West Pakistan will be regarded as an offense, and subject to punishment by imprisonment, a fine, or both. The ordinance does not apply to minerals necessary for the production of nuclear energy, mineral oil, natural gas, and such mineral products as may be regulated and controlled by the Federal government.

MALAYA—The target date for complete Malayanization of the Mines Department in Malay is 1965. By the end of this year, the North region—Perak, Penang, Kedah, and Perlis—will be Malayanized by half. The present main office of the region consists of six inspectors, headed by the Senior Inspector and his Deputy. About 20 Malaysians are presently studying mining engineering overseas; 10 of them are on the Colombo Plan scholarships.

PAKISTAN—The government of West Pakistan has established three regional headquarters for streamlining the mineral development program. These headquarters will be located at Quetta, Lahore, and Peshawar. The Deputy Director of Mines will be in charge of each region. A school is to be set up in Quetta for training mine supervisors and managers.

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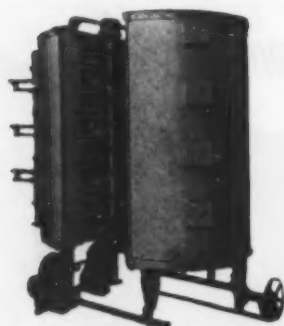


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COPPER ORES	LIMESTONE
TIN ORES	MOLYBDENUM
NICKEL ORES	BONE CHAR
LEAD ORES	DIATOMITE
SODA ASHES	LIME SLUDGE
FULLERS EARTH	MAGNESIUM
CARBON	CLAY GRANULES
PYRITE	ANTIMONY

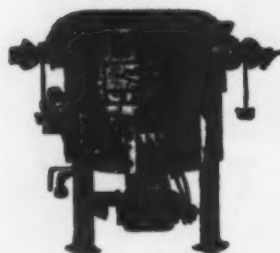
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Lake, Delivered, destinations, USA	29.00¢
Foreign, Copper, Valley basis	29.00¢
Custom	28.50¢-29.00¢
LEAD: Common Grade, New York (Per pound)	13.00¢
Tri-State Concentrate, 80% lead, per short ton	\$156.12
ZINC: Prime Western: F.o.b. E. St. Louis (Per pound)	11.50¢
Prime Western: Delivered, New York	12.00¢
Tri-State Concentrate, 60% zinc, per ton	\$68.00
ALUMINUM: Primary 30 Pound Ingots (99% plus) (Per pound)	26.80¢
ALUMINUM: Lone Star Brand, F.o.b. Larado, in bulk (Per pound)	29.50¢
BISMUTH: (in ton lots) price per pound	\$2.25
CADMIUM: Sticks and bars, 1 to 5 ton lots (Price per pound)	\$1.45
COBALT: 97.99%, keg of 550 pounds (Price per pound)	\$2.00
COLUMBIUM: Powder	Nom., per pound \$55.00-\$85.00
GERMANIUM: Germanium: dioxide, high purity, gram	18.50¢
LITHIUM: 98% (per pound)	\$11.00-\$14.00
MAGNESIUM: Ingots (98.8%) F.o.b. Valasco, Texas, per pound	36.00¢
MERCURY: Flasks, Small lots, New York	\$223.00-\$227.00
NICKEL: "P" Ingots (5 pounds), F.o.b. Port Colbourne, Ontario	75.50¢
PLUTONIUM: To July 1, 1962 AEC will pay \$30.00 to \$40.00 per gram depending on plutonium 240 content, July 1, 1962 to June 30, 1963, per gram	\$30.00
SELENIUM: 99.5%, per pound	\$7.00
THORIUM: per kilogram	\$43.00
TIN: Grade A Brands, New York (Per pound) Prompt delivery	\$1.70-\$1.85
TITANIUM: 99.5% Ingots (5 pounds), F.o.b. Port Colbourne, Ontario	\$16.75
URANIUM: Red (0.790 U-235) \$16.00 Per Pound; Foil	\$7.725
U-235: Nominal (Per pound)	\$35.00 per ounce
GOLD: United States Treasury Price	895¢
SILVER: Newly mined domestic, U.S. Treasury price per ounce	901¢
Foreign Handy Harmon	\$52.00-\$55.00
PLATINUM: Per ounce	\$5.00
ZIRCONIUM: Sponge, Per pound, Reactor Grade	\$5.00

ORES AND CONCENTRATES

BERYLLIUM ORE: 10 to 12% BeO, F.o.b. mine, Colorado	\$46.00 per unit
Small lot purchases at Custer, S. D., Spruce Pine, N. C., and Franklin, N. H. Visual inspection at \$400.00 per short ton or by assaying at: 8.0 to 8.9% BeO, \$40 per unit; 9.0 to 9.9% BeO, \$41.00; 10.0%, \$48.00.	
CHROME ORE: F.o.b. railroad cars eastern seaports. Dry long tons	
African (Rhodesian), 48% Cr ₂ O ₃ , 3 to 1 Ratio	\$44.00-\$45.00
African (Transvaal), 48% Cr ₂ O ₃ , No ratio	\$31.00-\$33.00
Turkish, 48% Cr ₂ O ₃ , 3 to 1 chrome-iron ratio	Nominal \$50.00
U.S. Government ore-purchase depot Grants Pass Oregon, Buying suspended, quota filled.	
COLUMBIUM-TANTALUM ORE: Per Pound Pentoxide Nominal	\$1.00
IRON ORE: Lake Superior, Per gross ton Lower Lake Ports	
Mesabi, Non Bessemer, 51.5% Fe	\$11.45
Mesabi, Bessemer, 51.5% Fe	\$11.60
Old Range Non Bessemer	\$11.70
Old Range Bessemer	\$11.85
Swedish, Atlantic Ports, 60 to 68% Fe Contracts, Per Unit	26.00¢
MANGANESE ORE: Metallurgical grade, 48 to 50% Mn, Long ton unit	\$1.05-\$1.10
Metallurgical grade, 46 to 48% Mn, Long ton unit	\$1.00-\$1.05
Metallurgical grade, 44 to 46% Mn, Long ton unit	\$0.95-\$1.00
Domestic U.S. Government purchasing depots: Butte, Mont.; (black and pink ores) base price of \$4.87 per long dry ton of 18% manganese ore, Phillipsburg, Mont.; base \$6.43 per long ton of 15% manganese ore, Small lot program f.o.b. railroad cars, minimum 40%.	
Base (48%) \$2.30 per unit with premiums and penalties.	
MOLYBDENITE CONCENTRATE: 90% MoS ₂ , F.o.b. Climax, Colorado, Per pound Mo, plus container cost	\$1.25
TUNGSTEN CONCENTRATE: Domestic, 60% WO ₃ Per short ton unit	Nominal \$21.00
Foreign, 65% WO ₃ Per short ton unit (Scheelite)	Nominal \$14.00
Foreign: South American, Spanish, Portuguese	Nominal \$13.00
URANIUM ORE: F.o.b. pithead or depot or company mill in accordance with AEC schedules and company buying contracts. Basic price is \$1.50 per pound of U ₃ O ₈ in ore assaying 0.10 percent. For each additional 0.01 add 20¢. Subject to development allowance, premiums, penalties where applicable.	

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Oil Well grade, Packed in 100 pound paper bags	\$14.00
BORON: Technical grade	F.o.b. Boron, California, Per ton \$47.50
FLUORSPAR: Metallurgical grade, 72.5 % effective CaF ₂ content per short ton F.o.b. Illinois-Kentucky mines	\$36.00-\$40.00
Mexican, 70% F.o.b. border	\$26.00-\$27.00
Acid Grade, 97% CaF ₂ , Bulk, F.o.b. mine	\$48.00-\$52.00
Government buying F.o.b. producer's shipping point: 60% Illinois-Kentucky, \$34.50 per ton, others \$28.50; 70% Ill.-Ken, \$38.50, others \$32.50.	
PERLITE: Crude: F.o.b. mine per short ton	\$3.00 to \$5.00
Plaster grades, Crushed and sized, F.o.b. plants	\$7.00 to \$9.00
SULPHUR: Long ton, F.o.b. Hoskins Mound, Texas	\$25.00
Export	\$24.00-\$25.00

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December 22, 1958

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		per pound
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LEAD: Refined 99%	£ 71	15s Od 8.97¢
ZINC: Virgin, 98%	£ 75	15s Od 9.47¢
ALUMINUM: Ingot, 93.5%	£180	Os Od 22.50¢
ANTIMONY: Regulus, 99.6%	£197	10s Od 22.69¢
TIN: Standard, 99.75%	£158	10s Od 24.81¢
TUNGSTEN: Long ton unit	97s	£13.58

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- 1-40 HP Vulcan #22C
- 2-30 HP N & B
- 1-30 HP Fairbanks-Morse
- 1-30 HP Vulcan
- 1-30 HP B & B
- 1-75 HP Vulcan
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- 1-112 HP Vulcan
- 2-125 HP Ottumwa
- 2-150 HP Vulcan
- 1-200 HP Ottumwa
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- 1—37 HP Single Drum
- 1—40 HP Vulcan #22C
- 2—50 HP H & B
- 1—50 HP Fairbanks-Morse
- 1—50 HP Vulcan
- 1—50 HP Box
- 1—75 HP Vulcan
- 2—100 HP Box
- 1—112 HP Vulcan
- 2—125 HP Ottumwa
- 2—150 HP Vulcan
- 2—200 HP Ottumwa
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- 20—Ingersoll-Rand Model JR38A Jack Drills
- 7—Gardner-Denver Model FL48-4 Air Leg Drills
- 3—Thor Model 390 Air Leg Drills
- 6—Atlas Copco Model BBL22 Jack Drills
- 6—Ingersoll-Rand Model DA35 Drifters

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- 1—2" Symons Cone
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- 1—1 1/2" Vacsual
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- 2—3" A.S.H. Hydrosual
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- 1—3" A.S.H. Hydrosual
- 2—2" Wilfley
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- 1—4" Wilfley
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- 1—4' x 10' Allis-Chalmers Double Deck

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- 1—7' x 5' Allis-Chalmers Ball Mill
- 1—8' x 22' Hardinge Conical Ball Mill
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- 1—4' x 10' Hardinge Rod Mill
- 2—5' x 10' Traylor Rod Mills

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- 1—10" x 16" Universal Jaw Crusher
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- 2—7 Ton General Electric Battery Locomotives
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- 1—7 Ton Atlas Battery Locomotive
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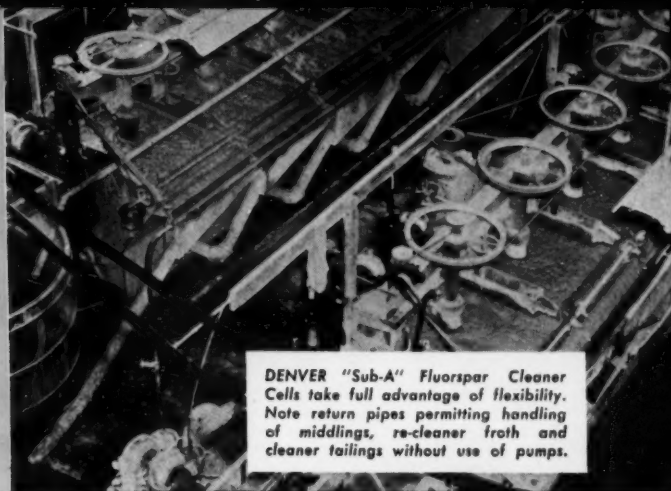
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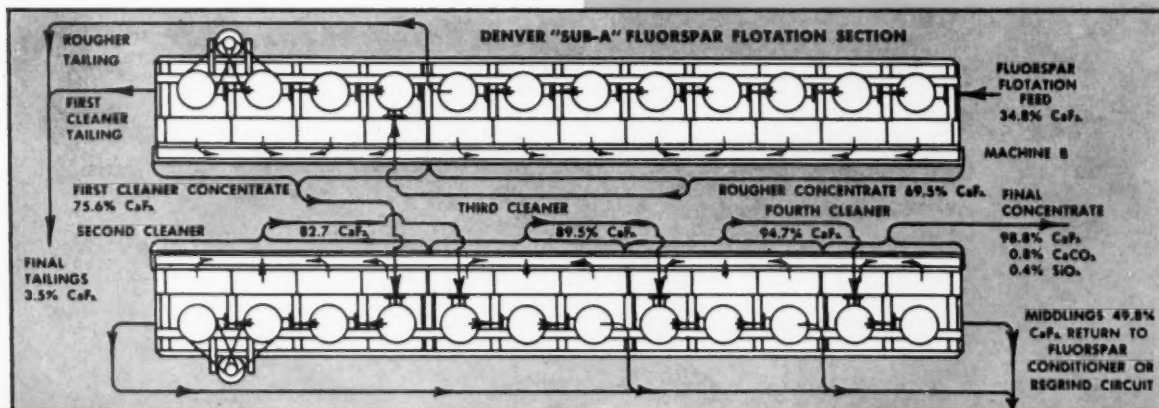
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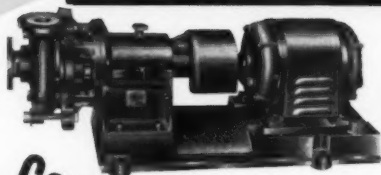


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